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CONCESSIONS FACILITIES HANDBOOK

PLANNING
DESIGN
CONSTRUCTION

AUGUST 1989

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CONCESSIONS FACILITIES HANDBOOK

PLANNING, DESIGN
AND CONSTRUCTION

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DENVER SERVICE CENTER
PROFESSIONAL SUPPORT DIVISION
CONCESSIONS BRANCH

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INTRODUCTION

This handbook was prepared to help the National Park Service (NPS) and concessioners plan, design, and construct concession facilities.

The handbook includes various standards, rules-of-thumb, design considerations, and suggested procedures. Unless specified otherwise, these are to be considered as recommendations, and not requirements.

Each chapter highlights key items for consideration, and suggests various steps to take and questions to ask about a project. As such, the handbook is not intended to replace professional assistance and advice, or act as a textbook. Professional design assistance is encouraged. Also, the handbook includes references to various texts which may be useful in development projects.

When architects, design firms, or contractors are hired to design or construct a facility, the park or concessioner should provide a copy of this handbook, or applicable portions of it, to the firm at the beginning of the project. Private firms should be aware of the required and recommended NPS procedures before the initial stages of a project. Other procedural materials which should be provided are listed in chapters I and VI.

Differences of opinion can exist within the planning and design industry and the NPS on some standards and procedures. Designers, reviewers, and park/regional staff may choose to adopt a different standard or change a procedure suggested in this handbook in instances where conditions or adopted procedures require such a change.

This handbook was prepared by the Concessions Branch of the NPS Denver Service Center. The branch provides technical assistance and guidance to Park Service offices in the areas of concession and park planning, economic feasibility studies, facility design, operational reviews, and other park concession-related projects.

The handbook was originally issued in October 1966, with chapters on food and beverage service, overnight accommodations, marinas, and design/construction procedures. This 1989 edition includes a new chapter on concession seasonal employee housing, along with revisions to the other chapters.

The authors of the handbook hope it will be useful in the initial design process, as well as in the overall construction phase.

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I. GENERAL GUIDELINES

PRELIMINARY PLANNING

Prior to determining the type of concession service and facility needed, especially for new areas, a market and economic feasibility study should be conducted. The market study should reveal particulars such as comparable services available in the immediate area, visitation trends, party size, length of stay, predominant arrival times, tour group demands, availability of labor and delivery capabilities of purveyors. The results of the study should indicate the type of facility most appropriate to meet visitor needs. If it is found that visitor needs and park goals as revealed in the General Management Plan (GMP) or Development Concept Plan (DCP) are not in agreement, discussions should be held to resolve these differences.

Of equal concern are the financial ramifications of a proposed operation such as how it will be funded (National Park Service or concessioner), type of capital and its availability, location and available space, the future potential of the business and projected profit.

Additional information on concessions planning can be found in the planning section of NPS-48, Concessions Management Guideline.

DESIGN PROCESS

Concessioners are often responsible for developing drawings and specifications for NPS approved construction projects including the renovation of buildings as well as construction of new buildings. These designs are submitted to NPS for review, comment, and eventual approval. Chapter VI of this handbook provides guidance and recommendations on procedures to follow in the design and construction process, as well as applicable NPS management policies.

Copies of regional office design and construction procedures, the handicapped access chapter of NPS-48, NPS-10, Drafting Guideline, and this handbook (or appropriate chapters) should be given to the concessioner and his/her architect.

Facility designs, except in the cases of very simple construction (as determined by NPS), must be prepared by a licensed architect or engineer (A&E). They must comply with the Life Safety Code (NFPA 101) and other national fire codes, the National Electric Code, the Uniform Plumbing Code, the Uniform Building Code, and U.S. Public Health Service guidelines. Designs must be predicated on the latest technology of construction, materials, energy conservation and efficiency of operation, as well as compatibility with the environment.

In accordance with the provisions of NPS-48, a pre-design conference should be held with the concessioner, the A&E, park and region to ensure a mutual understanding of the project's objectives and requirements. Suggested checklists for preliminary design, final design and construction phases are provided in Chapter VI of this handbook.

VISUAL QUALITY

In the planning, design and construction of park facilities, visual quality must receive considerable attention. A government or concession facility can enhance or seriously detract from the visitor's experience, depending on how and where it is constructed, and how it is maintained.

The 1985 NPS 12-Point Plan states that to "provide opportunities for unique experiences, design solutions and maintenance standards must reflect the meaning of place, time, and location, as well as the purpose of the park. Development must be artfully woven in with the resources and contribute to the achievement of the park's natural, cultural, and recreational resource management objectives."

The Plan further states that the Service intends to "Provide visitor and management facilities that are harmonious with resources and visually pleasing in their simplicity . . . .," and to "Improve through maintenance or rehabilitation the quality of facilities and their immediate developed areas in all parks . . ." The Plan speaks directly to concessions development by indicating the Service intends to "Ensure that planning and development of all concession facilities are in harmony with the setting."

Design elements or goals park managers, concessioners and architects should consider include:[1]

Buildings to be an accessory to nature
Non-intrusive design
Simplicity and restraint in design
Respect for past building traditions and practices
Use of indigenous materials (sources outside park boundary) in proper scale, that weather well
Retention of natural site character
Sensitivity to site ability to absorb modifications
Coordination of design of individual structures with that of the site plan as a whole
Perceptual structure congruent with actual use (visual legibility)
Unification by style of architecture and limited building materials
Assimilation through color, scale, location and silhouette

Attention should be given to non-public facilities as well as lodging, food service, marina and other types of visitor-use development.

INTERPRETATION OPPORTUNITIES

In the design of buildings, potential interpretive opportunities should be considered. The 12-Point Plan suggests that park facilities should "whenever possible, provide interpretation/information opportunities." The Plan also indicates the Service intends to "Identify proper roles that concessioners might fulfill in augmenting the basic interpretation of park resources." The visitor's park experience can be further enhanced by the incorporation of design elements or operation opportunities which interpret the park's historic or natural themes.

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[1] From Scope of Work, "Architectural Character Guidelines," Sequoia/Kings Canyon National Parks, September 1988.

Recent examples of successful interpretive design and renovation efforts include:

- the Anasazi exhibit located between the lodging registration area and restaurant at the Bullfrog Resort, Glen Canyon National Recreation Area
- period restoration of the lobby and restaurant at Lake Yellowstone Hotel, Yellowstone National Park
- restoration (and tours of) the El Tovar Hotel, Grand Canyon National Park
- furnishings and operations of the City Tavern restaurant, Independence National Historical Park
- restoration and replacement of facilities at Lake Crescent Lodge, Olympic National Park

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II. FOOD AND BEVERAGE OPERATIONS

This chapter will highlight specific items which must be considered early in the planning and design stages for food service facilities. These include needs assessments, the desired type of food facility, space requirements and design review requirements.

NEEDS ASSESSMENT

As mentioned in Chapter I, a market study is recommended to determine if a need exists for the service being considered, and if so, the potential type and number of customers that may be expected. This "needs assessment," along with estimating anticipated peak loads and "turnover" are initial steps in determining the size of a food facility. It should also be noted that the use of rule-of-thumb lodging guest-to-dining seat ratios can be very misleading due to the many variables affecting food service demand as indicated below.

A market study (or needs assessment) begins by asking many questions. For example, what customers are available? Only hotel guests? Are there housekeeping cabins where guests will prepare some meals? Is the area primarily a day-use area? Is it heavily used every day? Are there drive-through travelers? Campers nearby? Tours, scheduled and unscheduled? Families, senior citizens, hikers, groups requiring special attention? Do users have other dining alternatives? Will guests linger at dinner or do they have other activities available? Etc.

What do the customers need (expect, desire)? A cafeteria meal, a steak-house, different levels of service at different times? If there are no other alternatives, do they need a place to get out of the weather? Is there a need to be available for all three meals, even though one may be unprofitable? (Areas with overnight facilities must have at least one food service facility offering three meals.) Do you need to use the dining room for something besides a restaurant -- lectures, for example, or evening entertainment? Or, will separate facilities be provided? What does future demand look like? Etc.

After appropriate reflection is complete, the needs that the restaurant is to serve might be summarized as in the following example:

"1. Seven days a week, 6:00 a.m. until 10:00 p.m., operation year around with many dead periods during the day. Restaurant will be the only space guests will have to get out of the weather - expect a lingering user population.

"2. Three meals a day:

"a. Breakfast serving 100 lodge guests maximum. Room rate is $60/night and the typical user is a retired couple. Primary dining time preference is between 6:30 and 7:30.

"b. Lunch use is widely variable -- 50 to 300 persons, depending on season. Users include lodge guests, many young families and wheelchair-bound people attracted to an especially accessible nature trail system. Use drops off during bad weather, but many enjoy watching the weather from the restaurant or lounge. The park sponsors inner city school trips that typically include lunch at the restaurant. Primary arrival times are 11:30 to 12:30.

"c. Dinner is for 100 maximum lodge guests and a group of local residents (10-15 persons per night average), who use the restaurant without regard for its park affiliation. Maintaining this connection and having it seem as a positive aspect of the park is thought to be good public relations with the local community. Some off-season meeting and function business comes to the restaurant from the local community and is important to maintaining the financial viability of the winter restaurant operation. Primary dining time preference is between 6:30 and 7:30.

"3. Etc."

Such statements help to form a program document that describes what the restaurant should be designed to do. After those objectives are established, an effective design process can begin, including establishing the size of the restaurant.

Peakloads

There are certain trade-offs to be made concerning the number of seats in a restaurant that are related to construction and operation costs. For example, an operation might need to accommodate 50 luncheon guests on a slow off-season midday and 300 during a busy in-season lunch. Designing to seat and serve the 300 at 12:00 noon with no waiting will cost the greatest amount to construct and be the least cost effective to operate. Designing for the 50 will mean a very busy and operationally cost effective restaurant and require the least amount of capital to be invested. However, there will be long lines of waiting customers and many complaints. The proper approach is to design for somewhat less than the absolute peak business and to expect to spread the available customers over a period of time at each meal period.

The length of each meal period should be considered. Breakfast users may tend to arrive during a one-hour period (i.e., between 6:30 and 7:30). Lunch users may tend to arrive between 11:30 and 12:00 in an urban area, or half of them may arrive before 11:30 or after 12:30 in a rural area. Dinner users will tend to eat around 6:00 at a family restaurant, or prefer 7:00 at a fancy restaurant. Thus peakloading must be considered in terms of use each hour as well as meal period.

"Flexibility" areas are sometimes used to provide extra area as needed to meet peak loading requirements. For example, a seating area between a lounge and dining area can accommodate larger food service demands at lunch, when the lounge is not heavily used, or serve as a holding area for dinner. Also, if a meeting room is to be a part of the operation, locating it contiguous to the dining room would allow it to be used to meet peak load demands.

Turnover

Many restaurant operations use the number of times a seat in the restaurant is used each meal as one measure of business success. This is called turnover. Measuring anticipated hourly turnover can also be a useful planning tool.

Turnover rates vary considerably depending on the meal (breakfast, lunch, dinner), the menu offered, amount of service and type of furnishings. A table at a cafeteria may be used for only 25 minutes for breakfast, while a table in a fine dining room could be occupied for 90 minutes for dinner. In the first example, the table could be used 2.4 times in an hour; in the second example, .7 times an hour. Dividing the estimated number of guests by various ratios will provide a rough estimate of the number of seats needed to meet the demand for different meals and types of service.

The following chart can be used to initially estimate turnover ratios. The time listed includes eating time, service and time at the table before and after the meal. These times and ratios should be adjusted based on local factors that might affect the length of meal.

MEAL TURNOVER ESTIMATED TIMES

	Leisure Dining		Family Restaurant		Counter Service		Cafeteria	
	Time	Ratio	Time	Ratio	Time	Ratio	Time	Ratio
Breakfast	50 min.	1.2	35 min.	1.7	30 min.	2.0	25 min.	2.4
Lunch	60 min.	1.0	45 min.	1.3	35 min.	1.7	25 min.	2.4
Dinner	90 min.	.7	65 min.	.9	40 min.	1.5	35 min.	1.7

Dining seats are generally never completely used at one time. A table for four may be occupied by three persons, guests come at different times, and some will stay longer than normal. Occupancy vacancies can range from 20 percent of total capacity for restaurants to 15 for cafeterias and 10 percent for counter service. The estimate for needed seats should be adjusted upwards by the appropriate amount.

Once a ratio has been applied, it may be determined that the number of seats needed to accommodate that particular meal is excessive compared to other meals, and that a different type of food service (or combination of food services) may need to be considered. It is normal and desirable to spend some time reviewing the needs assessment, types of potential food services, peak loading estimates and turnover rates a few times before settling on an estimated number of seats. The next step is to apply this number to the seat space allowance to estimate the size of the dining area.

In situations where the size of the food service is predetermined, the process would be reversed by beginning with the seat space allowance to determine the number of seats available for the proposed type of food operation. The turnover rate would then be applied to determine the number of meals that could be served.

Predicting demand and seating space requirements for a food service is not an exact science, but use of these steps will contribute considerably towards a reasonable design solution.

TYPES OF FOOD FACILITIES

The type or combination of food service(s) desired should be an initial determination. This decision will be influenced by the anticipated clientele (overnight and/or day-use, seniors, school groups, families, etc.), percentage of tour groups, anticipated peak loading, other nearby facilities, if any, etc. Types of food facilities to be considered include:

Fast Food

Limited menu, quick service, fast seating turnover, inexpensive prices, and take-out service are features.

Cafeteria

Cafeterias can serve large numbers quickly with less personnel, provide less expensive meals and provide fast seating turnover. Cafeterias are sometimes used in parks where the provision of adequate housing is a problem, because of smaller staffing requirements. Three types of cafeterias can be considered.

Straight Line. This is the traditional cafeteria operation, using a "straight-line" serving counter. Some cafeterias provide personnel to carry trays to tables, and will bring cook-to-order entrees to the customer's table. To facilitate peak loads, and provide opportunities for second helpings and later purchases, some cafeterias issue a ticket when leaving the line, and a short line for subsequent purchases. The ticket is paid at a controlled exit during busy times, and at the line during slow periods.

Today, emphasis is being placed on the following two cafeteria systems in urban areas:

Hollow Square or Scramble System. This concept provides for several lines usually along three sides of a room, each offering a different type of food (hot, cold, salad, drink, etc.), and is more appropriate for larger operations. It requires more serving space, but can serve customers more efficiently and faster, and is more adaptable to meal count fluctuation. This system may appear somewhat more confusing than the straight-line concept, and is generally more efficient where there is a return clientele familiar with the system. These disadvantages [illegible] be partially overcome through signs or by having concessioner personnel assigned to assist and direct patrons in obtaining their food.

Cluster. This version of the scramble system offers various food counters offering different types of foods (Mexican, hamburgers, pizza, ice cream, sandwiches, etc.), all clustered in one area with common seatings for consumers. As a cafeteria operation, food is paid for at an exit register. As separate fast-food operations, they become part of a "food court," which are now used successfully in shopping centers and in free-standing restaurant operations. The number of counters should match anticipated patronage. This system would best work in park developed areas with heavy visitation.

Table Service

Fine Dining. Emphasis is on high quality food, service, china, glassware, furnishings, etc. A nearby coffee shop is usually available in the park developed area to provide a less expensive choice for meals.

Family Dining. These restaurants are less formal and expensive than fine dining rooms, but more leisurely and offering a more extensive menu than a coffee shop. They are typical of many park restaurants.

Coffee Shop. The emphasis is on quick service and economy of menu featuring entrees and sandwiches. They may offer 24-hour breakfast, a complete soda fountain service, some take-out items, counter and/or table service. A coffee shop differs from a "fast-food" service in that it offers a more extensive menu and emphasizes sit-down service rather than take-out.

SPACE REQUIREMENTS

Space requirements for an entire facility are dependent upon several considerations, including the type of operation, menu, projected patronage (considering peak loads), purveyor's delivery schedule, etc. The operation can generally be divided into several areas to be considered: dining area(s), service and guest facilities, and the "back of the house" production areas (kitchen, storage, cleaning area, employee facilities, office, etc.).

Dining Area

The typical restaurant is designed around the number of seats. Kitchen size, storage space, staff costs, operating expenses of all types, and capital cost are all related to the number of seats specified and the type of restaurant to be operated. The objective is to achieve the highest turnover per meal period (most efficient use of dollars invested) while also offering the type of service to which restaurant guests are entitled.

The following chart will provide some industry standards for dining area space requirements. These are rule of thumb figures, however, they will be useful in preparing preliminary planning estimates. (Seating capacities are not provided for fast-food operations because of the extensive variations in this type of service.)

DINING AREA SPACE ALLOWANCE PER SEAT

Type of Operation	Allowance Per Seat (Sq. Ft.)*
Cafeteria**	15-18
Counter Service	17-20
Table Service (minimum 15 preferred)	12-16
Table Service, Fine Dining (minimum 20 preferred)	17-22

*Includes space for tables, chairs, aisles and service stations

**Includes serving area.

The above space requirements are affected by the type of menu items (processing times); the size and arrangement of tables, chairs, booths, etc.; table vacancy rates (unused seats at a table); the amount of desired comfort and privacy and the efficiency of service. A detailed discussion of these factors can be found in Kotschevar, listed in the Bibliography.

The availability of deuces (tables for two) which can be used by one or two persons, or put together with other tables to accommodate larger parties, provides an element of flexibility which can greatly affect a dining room's effective capacity. All seats will not be occupied at all times. For example, a party of three may occupy a "4-top" or a single may occupy a deuce. Effective available seats can thus be reduced by a large percentage if only 4-tops are provided.

Cafeteria space requirements also vary according to the type of tables used. Tables for four are generally used in concession facilities rather than picnic-type tables arranged "cafeteria-style" as are found in institutional settings. If a visitor profile is available and indicates most visitors to be couples, then deuces should be employed for the majority of seating.

Per "seat" square footage for cocktail lounges and bars can vary considerably depending upon the type of facility and its atmosphere. A quiet lounge or holding lounge for guests waiting for tables may offer about 18 sq. ft. per seat, including aisles, circulation areas and the bar.

Service and Guest Facilities

Space requirements for service and guest facilities such as waiting areas, rest rooms, coat rack area, public telephones and entrance areas should be determined separately from the dining areas. The size of these spaces is generally dependent upon the type of operation. The size of individual areas should be based upon the number of people who will be congregating at one time while awaiting service as well as the type of service offered. For example, peak loading resulting from waiting for a dining room to open for dinner or the arrival of tour groups may require a larger waiting area. Smaller areas such as toilet facilities and coat racks should be located close to the waiting area for the comfort and convenience of the guest.

A minimum of about 250 sq. ft. or 15 percent of dining space, whichever is larger, should be considered with additional space for larger rest rooms or holding areas for larger operations.

See Chapter 3 for information on historic furnishings considerations for dining areas.

In addition to the above, gift shops located near a food service waiting area offer something for the guest to do both before and after a meal and generate income for the concessioner.

Production Areas

The location and allocation of space for each activity within the total "back of the house" area is crucial to the efficiency of the operation.

Space considerations for production areas (food preparation and cooking, storage, cleaning and delivery areas) are provided below. For general planning, the following chart may be a useful beginning point for estimating production space needs.

PRODUCTION SPACE PER SEAT

Table Service	8-12 sq. ft.
Counter Service	4-6 sq. ft.
Cafeteria Service	8-12 sq. ft.

Source: From Kazarian, page 186.

Food facilities using primarily fresh items (including baking) requiring additional equipment and worker space, will need higher square footage numbers. Also, remote park areas with greater storage needs will require more space.

Food Preparation and Cooking Areas. These areas include all space necessary for meat and vegetable preparation, baking, cold food preparation, etc. Approximately one-third to one-half of the total dining room size is sometimes used as a guide for space which should be allotted for food preparation and cooking, but many factors such as volume of meals, variety of food, type of operation and preparation, and seating arrangements will affect this ratio. For example, this ratio of kitchen space to dining seats would be lower for high volume operations.

In the selection of equipment for the kitchen, the type of menu to be offered (continental, ethnic, fast food, etc.) will affect the type and size of equipment necessary for food preparation. For fast-food operations where considerable carry-out service is anticipated, additional kitchen space may be required. The kitchen should be arranged for its maximum efficiency to permit a direct flow without cross traffic or interference between areas.

Common and Dry Storage. Inventory should be turned over as often as possible provided adequate delivery service is available from purveyors. Once-a-week turnover would constitute the ideal situation for food items and heavily used supplies. An established adage of the industry states that high inventory goes hand in hand with high food costs. However, it is recognized that in many park facilities, additional space will be required because the purveyor's delivery is not on a weekly schedule or because the concessioner has to gather and haul all of their own supplies.

Soaps, cleaning materials, and other potentially hazardous items must be stored in a separate area from food. Foodstuffs, liquor, wine and expensive flatware require secured storage areas.

Refrigerated Storage. Refrigerator and freezer space requirements depend upon the type of menu and availability of delivery service. Again, additional refrigerator and freezer space will be required in remote areas without weekly purveyor service.

Cleaning Areas - Dishwashing. The space needed for a dishwashing area will vary according to the dishwashing method, equipment used, the amount of space needed for dirty and clean dish-holding areas, etc. Larger operations will want to consider pot-washing facilities in addition to the dishwashing facility.

Delivery Truck, Dock and Receiving Area. This facility must be direct and convenient to storage and kitchen areas, and should be as inconspicuous to the public as possible.

Employee Facilities and Office

Approximately 6 to 12 percent of the total area should be allocated to employee and office areas depending upon the type and size of service. This percentage tends to be larger in park concession facilities than in typical food service facilities because of on-site housing of employees. The higher percentage would be used when the employee dining room also serves employees from other departments (lodging, marina, merchandise, etc.). The employee dining area should be pleasant as well as efficiently planned space, not an afterthought in an unused corner of the building.

Summary of Space Allocations

The following examples will illustrate space allocation calculations for four typical types of food service facilities. They should not be considered to be absolute space requirements for any particular operation. Total space will vary based on projected patronage, desired seat allowance space, type of furnishings, level of service, etc.

SAMPLE SPACE ALLOCATIONS[1]

	150 Seat Cafeteria		50 Seat Counter		75 Seat Coffee Shop		175 Seat Dining Room	
	%	S.F.	%	S.F.	%	S.F.	%	S.F.
Dining Area	53%	2,550[2]	60%	900	48%	975	50%	2,975
Service & Guest Facilities	8	380	17	250	12	250	7	450
Production[3]	31	1,500	17	250	30	600	32	1,925
Employee Areas[4]	8	400	7	100	9	190	11	650
TOTAL SPACE[5]		4,830		1,500		2,015		6,000

[1] Sample calculations based on following space allowance (square footage per seat) assumptions: Cafeteria-17; counter-18; coffee shop-13; dining room-17.

[2] Includes serving line.

[3] Includes space for receiving, storage, food preparation and cooking, and cleaning. Space allocations (square footage per seat) used for this example: Cafeteria-10; counter-5; coffee shop-8; dining room-12.

[4] Sample calculations assume lower food service staffing needs per seat for the cafeteria and counter examples; and the use of the employee dining room by other departmental employees for all but the counter example: Cafeteria-9%; counter-7%; coffee shop-10%; dining room-12%.

[5] May not add up to 100% due to rounding.

DESIGN REVIEW AND APPROVAL

It is preferable that food service design be undertaken by experienced individuals/firms. If the principal A&E does not have a background in food service design (particularly kitchen design), then a subcontractor should be called for in the concessioner's (or NPS) design contract.

The following work centers should be considered critical to the success of any food service operation regardless of the type of service being provided:

1. Delivery truck, dock area, and receiving area
2. Wet and dry trash
3. Employee facilities (toilet, handwashing sinks, locker, dining)
4. Dry storage
5. Cold storage including compressor area
6. Dessert assembly, pantry, ice making
7. Main cooking - food preparation area
8. Short order preparation and pass-out section
9. Pot washing
10. Water and condiment stations - cafeteria; service stations - table service
11. Dishwashing
12. Office
13. Dining, including hostess and cashier functions
14. Bar and wine service location(s).

Prior to preparing the final working drawings for a facility, the proposal should be reviewed by a professional consultant (DSC Concessions Branch or regional office), and approved by the appropriate authorities.

ADDITIONAL RESOURCES

The following books are recommended for more detailed planning and design information.

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1982 *How to Manage a Restaurant*. Wm. C. Brown Co.

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1981 *The Complete Book of Cooking Equipment*. Van Nos Reinhold.

Another source of information is state and local restaurant associations. These resources would be useful to concessioners and park management as initial opportunities to consider other design components, such as furnishings, climate control and lighting, atmosphere, equipment requirements and layout, etc.

III. OVERNIGHT ACCOMMODATIONS

As discussed in Chapter I, a market study should be conducted prior to the construction of any facility. In addition to the general information included in the market study, more specific data should reveal the desired type of structure, the size of the facility to be built, including the number of units required, and the desired class of accommodation. This information is fundamental to further determining the design and sizing requirements of work and service areas within the operation.

TYPES OF LODGING STRUCTURES

Various terms are used to describe overnight accommodations, with some terms used rather interchangeably. For example, "lodge" is used for hotels, motels and cabins, or combinations of these types of accommodations. For planning purposes, overnight accommodations found within the National Park System may be categorized into five types of lodging. Each generally offers a different level of service as well as different design characteristics.

Hotels

Generally a single multi-story building which contains all facilities and services necessary to accommodate the overnight visitor, such as the Paradise Inn (MORA), El Tovar Hotel (GRCA), and Lake Yellowstone Hotel (YELL). In some instances the hotel complex may also include cabin or motel units. Services may include bellmen, room service, beauty/barber shops, restaurant(s) and bars, 24-hour desk service, rental cars, etc.

Motels

A building (perhaps multiple unit) with at-door parking. Food service (if any) may be separately housed. Auxiliary services are usually less extensive than with lodge/hotel operations. Thunderbird Lodge (CACH), Pisgah Inn (BLRI), and Nauset Knoll Motor Lodge (CACO) are examples of this group.

Cabins

Individual guest units (or sometimes duplexes) constructed as separate buildings. Food service is available, but other auxiliary services may be limited. Examples include Sol Duc Resort (OLYM), Colter Bay Village (GRTE), and Brooks Camp (KATM).

Hostels

Large dormitory style or individual rooms where no services or facilities are provided, with the exception of kitchens, such as at Golden Gate National Recreation Area and Point Reyes National Seashore.

Rustic/Tent Cabins

Minimum facilities, usually rooms without baths, such as those at Sperry Chalet (GLAC), Curry Village (YOSE), and Cinnamon Bay (VIIS). Cooking facilities and rental services (bedding, cooking gear, etc.) may be available. Food service is usually available nearby.

CLASSES OF ACCOMMODATIONS

Since park visitors have varying financial capabilities, different tastes, and wide expectations, it is the policy of the National Park Service that "where overnight accommodations are to be provided in a park, the concessioners shall maintain a reasonable proportion of their accommodations at low prices." Accordingly, for planning and design purposes, overnight accommodations have been divided into three classes: deluxe, standard and economy. These classes can be, but are not always, differentiated by such factors as construction, furnishings and room size.

The following chart will provide some initial guidance in this area, in terms of room size, construction, bath, furnishings and outside amenities. The Concessions Operational Performance Program (Chapter 20, NPS-48) provides other requirements which are applicable as minimum standards for all guest rooms, bathrooms, housekeeping and maintenance activities.

In addition to these three classes, there is a fourth class of accommodations which includes rustic cabins (probably without bath), tent cabins and hostels. Nostalgia and "roughing it" continue to be popular in many parks. Generally, these facilities offer only basic furnishings and a relatively small room. They should be clean and well maintained, but may vary in size and type of building and furnishings.

CLASSES OF ACCOMMODATIONS (SUMMARY CHART)

DELUXE	STANDARD	ECONOMY
1. Room Size	1. Room Size	1. Room Size
336 minimum sq. ft. (12 x 28, 14 x 24); with 360/364 sq. ft. (12 x 30, 14 x 26) preferred	288 minimum sq. ft. (12 x 24) for rooms with outside entrances, or one bed 312 minimum sq. ft. (12 x 26) for rooms with hall entrances	240 minimum sq. ft. (12 x 20) for rooms with one bed (double) 266 minimum sq. ft. (12 x 22) for rooms with two beds (doubles)
2. Construction	2. Construction	2. Construction
Quality construction with	Good construction with	Less expensive construction with
maximum soundproofing - STC 54	adequate soundproofing - STC 50	adequate soundproofing - STC 50
adequate insulation as discussed later in chapter	adequate insulation as discussed later in chapter	adequate insulation as discussed later in chapter
maximum ventilation - 50 cu ft per minute (cfm) outside air	adequate ventilation - 40 cfm outside air	adequate ventilation - 30 cfm outside air
full carpeting	full carpeting	full carpeting
individually controlled automatic heating and air conditioning, as required	individually controlled automatic heating and air conditioning, as required	individually controlled automatic heating and air conditioning, as required
3. Bath	3. Bath	3. Bath
Full bath with shower/tub combination	Full bath with shower/tub combination or shower stall	Full bath with shower/tub combination or shower stall
Exhaust fan (50 cfm)	Exhaust fan (50 cfm)	Exhaust fan (50 cfm)
Walls covered with hard, smooth, waterproof, easily cleanable surface	Walls covered with hard, smooth, waterproof, easily cleanable surface	Walls covered with hard, smooth, waterproof, easily cleanable surface

DELUXE	STANDARD	ECONOMY
Medicine cabinet with well-lighted mirror, electrical outlet, towel racks, clothing hooks, other amenities	Medicine cabinet with well-lighted mirror, electrical outlet, towel racks, clothing hook	Medicine cabinet with well-lighted mirror, electrical outlet, towel racks, clothing hook
4. Furnishings/Appointments First-class furnishings and appointments including carpeting, drapes, two easy chairs or couch and chair, end or coffee tables, minimum 36-inch round or square table and chairs, etc.	4. Furnishings/Appointments Adequate furnishings and appointments including carpeting, drapes, two easy chairs, minimum 24-inch round or square table	4. Furnishings/Appointments Less expensive furnishings including carpeting, two easy chairs, small end table
Beds - queens, queen plus sofa-bed, or king size, box springs or mattress foundation and innerspring mattresses with at least 312 coils of 12 mil. wire with frame wire of 6 mil.	Beds - long doubles, queens or king size, box springs or mattress foundation and inner-spring mattresses	Beds - double size, box springs or mattress foundation and inner-spring mattresses
Additional Appointments credenza and chest one or two nightstands desk and chair closet mirror lamps luggage racks	Additional Appointments credenza nightstand desk and chair clothes hanging facilities mirror lamps luggage racks	Additional Appointments triplex or credenza nightstand clothes hanging facilities mirror lamps luggage racks
5. Outside Amenities Covered porch Patio Two outdoor chairs and table		

DESIGN CONSIDERATIONS

A critical review of the following lodging functions (along with food and beverage service, gift shop and meeting room considerations) should be undertaken by an individual knowledgeable in design requirements for the hospitality industry.

All too often, support activities are provided insufficient space, a tendency which should be resisted to avoid operational problems and inefficiencies, and costly additions and modifications.

In all areas, pre-wired smoke detectors and alarms are required, and sprinkler systems should be considered.

In seasonal areas, consideration should be given to potential longer season or year-round use, through use of additional insulation and by designing for potential heavier heating demands to avoid later costly retrofits.

Guest Rooms

Guest room sizes and type of furnishings are suggested in the classes of accommodations summary chart. Space also must be allocated for corridors, stairwells, elevators, hopper rooms (linen carts and guest supplies) and vending. In the guest room portion of a lodging facility with interior, double-loaded corridors, these functions will need about 35 percent of the net guest room area (about 50 percent for hotels and deluxe facilities). Economy facilities, or motels with outside entrances will only need space for hopper rooms and vending (see following pages). Other considerations include:

Guest Capacity Per Room. For maximum efficiency, it is recommended that two double beds (or preferably, queen beds) be provided. Some rooms could be provided with one queen or king size bed and a sofa-bed, room size permitting.

Connecting Rooms. To accommodate large traveling parties, families, and those traveling with handicapped persons, approximately 15 to 20 percent of the total guest rooms should be inter-connecting.

Provision for Handicapped. At least 5 percent, but preferably 10 percent, of the rooms are to be designed and equipped for handicapped guests. Additionally, handicapped facilities should be provided in public areas such as rest rooms, access to the registration area, access to rooms and other ramps. Room design and facilities should comply with the criteria of the American National Standard Institute and the provisions of the Architectural Barriers Act.

Typical Furnishing Sizes. The following sizes can be used in estimating space requirements for guest room furnishings:

Beds = Twin	75"x38" (6'3"x3'2")	Full Long	80"x54" (6'7"x4'6")
Twin Long	80"x38" (6'7"x3'2")	Queen	80"x60" (6'7"x5')
Full (Double)	75"x54" (6'3"x4'6")	King	80"x76" (6'7"x6'4")

Credenzas/Dressers = 18" x 48", 18" x 68", 18" x 72"

Night Table = 18" x 14", or 22" x 14", or 20" x 16"

Chest = 38" x 18"

Luggage Rack = 34" x 18", 15" x 18"

Tables = 30" x 30", 36" x 36", 30" round, 36" round

Chairs/Seats = 18" x 18", 20" x 20", 22" x 22"

Desks = 24" x 36", 24" x 38", 24" x 40"

Room Security. All doors and windows must have adequate locking devices (also required in Concessions Operational Performance Program). Doors must have a double-locking system from the inside and be equipped with automatic closers.

Soundproofing. To minimize sound transmission between rooms and from corridors to rooms, walls and doors are to be constructed so that not more than a maximum of 35-40 decibels are transmitted. In multi-story structures, floors connecting adjoining units shall have the same sound transmission rating as walls and doors. All electrical outlets should also be insulated for soundproofing. See page 24 for additional soundproofing and insulation information.

Heating and Cooling. For individually controlled automatic systems, the heating capacity should be sufficient to obtain 80°F. inside temperature when outside temperature is 0°F. and air conditioning should be sufficient to obtain 70°F. inside when 100°F. outside.

Plumbing. Circulating pumps are to be provided as needed to deliver instantaneous hot water to all rooms. All bathroom plumbing fixtures are to be acid resistant and of a type that is easy to maintain. Mixing valves shall be installed to assure a maximum of 140°F. at all personal terminals such as showers and hand-washing facilities. Showers and toilets should feature low volume water restrictors.

Room Telephones. If room telephones are to be provided, rooms should be wired for telephones during construction.

Television. Prior to developing drawings, a decision should be made as to whether or not television is to be provided in guest rooms. If so, all rooms should be wired to accommodate a central receiving antenna system.

Public Areas

Lobbies. Lobbies generally require 6-11 sq. ft. per guest room, with the larger percentage used when tour groups, interpretive programs, or frequent inclement weather result in a need for larger space.

Retail Shops. Between 1-1.5 percent of the guest room area is typically allocated to retail space in hotels. However, park lodging facilities often allocate a larger area due to the higher demand for gifts and souvenirs.

Corridors. The width of corridors should be a minimum of 5 ft., with 6 ft. recommended.

Elevators. Passenger elevators should be provided in structures having three or more floors. Freight elevators should be provided in all structures with two or more floors. This is important for transporting linen and other supplies, for equipment being taken out for repair, and should be sized sufficiently to handle tour baggage.

Vending. One area for every 50 rooms should be provided and appropriately sized to accommodate candy, snack, cold drink, sundry and ice machines. Automatic ice machines dispensing a controlled portion of sanitary ice are preferred over bin style ice machines.

Pay Telephone. A few pay telephones should be provided for day-users. If room telephones are not provided, then one public telephone for every 20 rooms should be provided at locations convenient to guest rooms.

Tour Bus Staging Area. Facilities accommodating large tour bus patronage should have an adequate area(s) to handle baggage without inconveniencing hotel guests.

Parking. Sufficient space should be allocated for guest parking near guest overnight accommodations. The number of parking spaces will depend to a large extent on the mode of transportation visitors use in coming to the park and the rate of room occupancy. With a high room utilization (90 percent) and use of automobiles, a ratio of one parking space per room would be required. Where there is a large tour bus patronage, this ratio can be reduced. Space is also needed to accommodate buses.

Registration, Offices and Storage

Registration Desk/Area. The desk is located in a main lobby or possibly in a separate area near guest rooms. For the latter, conspicuous signs should be used directing guests to the desk. The registration area, including the desk will require a minimum of 120 sq. ft., and will include a key drawer or rack, switchboard, information rack and bookkeeping machine or computer for registration and cashier purposes. The desk (counter) should be a minimum 10 ft. in length for a 100-room operation. The area may need to be larger if the concessioner uses it to take reservations for transportation, pack trips, or other services. A mail drop should be nearby, and safety deposit boxes available for guests.

Reservations. Reservations for smaller lodging facilities are often handled in a small area located near the registration desk. Small (100 rooms or less) chain motels use a computerized system requiring very little space while similar size facilities without a chain affiliation may require a larger reservations area because of the manual nature of receiving reservation requests. Large hotels and resorts will also require a reservation office to handle telephone requests as well as mail volume. For a 100-room facility, a 200-300 sq. ft. office will be desirable, depending on the nature of the reservation system used.

Offices. Small lodging facilities have a minimum of two offices for use by the manager, bookkeeper/auditor and clerical personnel. A minimum of 300 sq. ft. should be allotted to offices for a 100-room facility, and preferably 450 sq. ft. for three offices, including an auditor's office which would be a secure area, including an alarm system and provision for a safe.

Office and Record Supply Storage. About 500 sq. ft. of total space (consisting of one or more rooms) is needed for storage of forms (often purchased in quantity to offset printing costs), supplies, and records (which must be stored for several years). It should be located near the general offices. Guest folios, restaurant and bar checks, and certain records should be placed in a lockable area.

Meeting and Banquet Storage Areas. Storage is necessary to store tables, chairs, etc., and is generally near an elevator or close to banquet facilities. About 15 to 20 percent of meeting and banquet space will be needed for storage, depending on the type of tables, chairs and equipment to be stored.

Housekeeping

Laundry Room. A laundry is usually not economical for less than 100 guest rooms. However, for small operations, depending on management operating methods and location of the operation, concessioners may choose to conduct their own laundry operation. To accommodate equipment and storage of soiled linen, approximately 600 to 800 sq. ft. is needed for a small property of 100-150 rooms. This would provide space for sorting soiled linen, two 85-pound washer-extractors, three 100-pound dryers, a 60-in. ironer, a double laundry sink and an extra-hand sheet folder. The room should be located near the main linen room.

Main Linen Room and Guest Supply Storage. This area should be located adjacent to the laundry room. To accommodate the storage of clean linen and guest supplies (toilet and facial tissues, light bulbs, matches, ashtrays, etc.), approximately 600 sq. ft. is needed for 100 guest rooms (800 sq. ft. if the laundry is also used for dining room linen, banquet linen, uniforms, etc.). Larger facilities will need additional space which will be determined by amount of linen (number of days' supply) and supply delivery schedules.

Hopper Rooms. At least one room is required for each guest floor for linen carts and guest supplies. The rooms should be located near elevators or stairways. Approximately 300 sq. ft. is needed per 100 guest rooms.

Laundry Chute. The chutes are usually located in or near the hopper room. If not located in the hopper room, it should be located in a secured room. The chute is to be 24 in. in diameter and should empty into the laundry room, or another room on the same floor as the laundry room.

Maintenance and Utilities

Maintenance Supply Room. This room is needed to accommodate supplies such as sinks, toilets, air conditioners, etc. App:oximately 500 sq. ft. is needed per 100 guest rooms.

Maintenance Repair Shop. The shop is generally part of the maintenance supply room. Approximately 200 sq. ft. is needed per 100 guest rooms.

Mechanical Rooms. The number of rooms required parallels the type of services provided, but generally a minimum of two are required (telephone and electrical). Approximately 150 sq. ft. is necessary for a telephone room, and from 150 to 300 sq. ft. for a transformer/electrical room depending on the size of the facility and if electrical heat is used.

Boiler Room. This room contains heating/air conditioning facilities, hot water heaters, etc., and requires at least 500 sq. ft. depending on equipment needed. It is generally located in the basement and should be constructed of fire retardant materials. Many new smaller and moderately sized facilities rely on individual room HVAC systems, with electric heat in offices and public rooms, which eliminates the need for a boiler room.

Support Services Space Allocation Summary

Following is a summary of approximate space needs for support services. This chart can be used for initial space estimates, subject to later design refinements. These functions are in addition to guest rooms, corridors, lobby, meeting rooms (if any) and food, bar and gift shop services.

SUMMARY OF APPROXIMATE SPACE ALLOCATION FOR LODGING SUPPORT SERVICES
(100-Room Facility)

1. Registration, Offices and Storage

- Reservations	200-300 sq. ft. depending on type of reservation system.
- Registration Desk/Area	120 sq. ft. with a minimum 10-foot long registration desk/counter.
- Offices	300-450 sq. ft. for 2-3 offices for use by manager, bookkeeper, auditor and clerical personnel.
- Office Supply Storage	500 sq. ft.
- Meeting and Banquet Storage Areas	15 to 20 percent of total space allocated for meeting and banquet rooms, depending on services provided and equipment used.

2. Housekeeping

- Laundry Room	600-800 sq. ft.
- Main Linen Room and Guest Supply Storage	800 sq. ft.
- Hopper Rooms	300 sq. ft.
- Laundry Chute	24 in. in diameter.

3. Maintenance and Utilities

- Maintenance Supply Room	500 sq. ft.
- Maintenance Repair Shop	200 sq. ft.
- Mechanical Rooms	150 sq. ft. per room (minimum of 2 rooms).
- Boiler Room	Minimum of 500 sq. ft. depending on equipment needed (for large facilities).

Historic Furnishings

Many of the early park hotels and other concession facilities figure importantly in the history of park visitation, and the historic character of these interiors should be preserved so far as is practical to successful concessions operations. Furnished houses and related structures remain extremely popular museum forms and, likewise, a well-executed historic space in a commercial structure would promote business as well as offer good interpretive opportunities.

During recent years the interiors of some concession facilities have been restored to historic periods, including use of historic furnishings. Along with park and regional historians, another source for assistance in the development of furnishing and decoration plans for historic structures is the Historic Furnishings Division at the National Park Service Harpers Ferry Center. The Division has performed extensively in developing plans for Service-managed structures and can be of equal benefit to concessioners.

For public areas (such as lobbies and restaurants) of concession-operated historic structures, the Division could prepare furnishings guidelines along the lines of the historic furnishings plans they regularly prepare for furnished structures in the Service. These guidelines would present documentation of historic interiors, such as historic photographs, visitor accounts and furniture purchase records. In fact, many documentary records remain in the hands of long-time concessioners. Following the documentary portion would be guidelines for furnishings replacement including:

> Recommendations for what period of a structure's history to target in redecorating;
>
> Recommendations for treatment of historic places still in use; and
>
> Descriptions of suitable replacement pieces including perspective drawings of rooms where appropriate.

A good understanding of the practical operational and commercial needs of a structure is the key to developing usable guidelines. The Division would work with the concessioner to this end.

The Division would design guidelines specifically for private sector use, as opposed to government use. For instance, they would provice broader and more flexible recommendations for the furnishings "plans" than found in reports for NPS facilities. Once familiar with a structure, they can also provide follow-up consultation on sources for furniture an fixtures.

The Historic Furnishings Division is project funded. They estimate project costs from $8,000 to $25,000 based on the complexity of the structure and the amount of available documentation. While this cost may sound high, it is not out of line with fees charged by private sector decorators for comparable projects.

This is not to suggest that use of the Division is mandatory for concessioner furnishing projects. However, it is an important resource for concessioners to consider. If interested, park staff should initially contact Sarah Olson (FTS 925-6519) to pursue this subject.

Soundproofing and Insulation Standards

The following standards are recommended for lodging facilities:

Soundproofing. Sound Transmission Class (STC) measurements are used for the following:

- to measure a construction's effectiveness in reducing airborne sound transmission
- to evaluate speech privacy potential
- to exclude low frequency [HVAC (heating, ventilation, air conditioning), vehicular] and amplified music sound.

The Uniform Building Code (UBC) states that in lodging accommodations, "wall and floor-ceiling assemblies separating dwelling units or guest rooms from each other and from public space such as interior corridors and service areas shall provide airborne insulation for walls, and both airborne and impact sound insulation for floor-ceiling assemblies."

A minimum rating of 50 is recommended for both Sound Transmission Class and Impact Insulation Class. Architects are referred to Chapter 35 of the UBC for additional information, including requirements for sealing and insulating openings for plumbing, electrical service, etc.

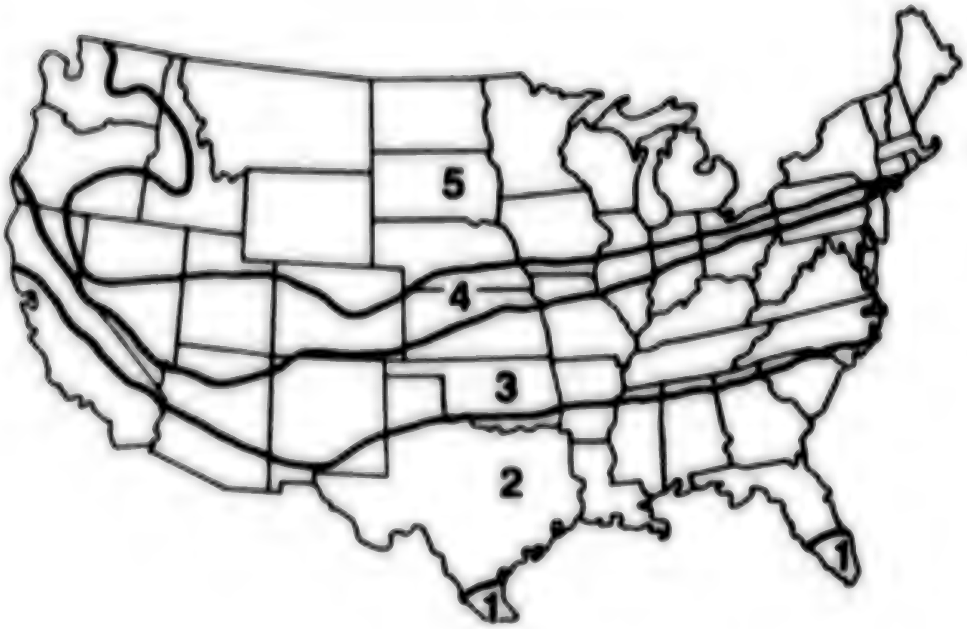
The above ratings, or local requirements if higher, are recommended.

Insulation. The amount of insulation installed will depend upon the geographical area in which the facility is located, and room quality (deluxe, standard, economy) will generally not be a consideration in the recommended minimum thermal resistances (R) of insulation. While economy rooms will rent for less than deluxe or standard, the cost to heat or cool these rooms will be greater if sufficient (or adequate) insulation is not installed. Therefore, the minimum recommendations for insulation should be based upon the most cost effective average for a geographical area.

The following map highlights regional minimum R-value requirements necessary to comply with the new Council of American Building Officials (CABO) Model Energy Code.

The following R-values are recommended as minimums, as adjusted for microclimates within a zone, or minimums required by local jurisdictions, if higher.

The following R-values are recommended as minimums, as adjusted for micro-climates within a zone, or minimums required by local jurisdictions, if higher.



R-Value Requirements

The zone map above highlights regional minimum R-value requirements necessary to comply with the new CABO Model Energy Code.

Zone	Ceiling R-Value	Wall R-Value	Floor R-Value
1	R-19	R-12	R-11
2	R-30	R-19	R-11
3	R-38	R-19	R-14
4	R-38	R-19	R-22
5	R-49	R-19	R-25

Source: Mineral Insulation Manufacturers Association

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IV. MARINAS

Why has this chapter been prepared? Perhaps the answer can be summed up in one word, "complexity." No other concession activity exceeds full marina operations in terms of the enormous number of variables one must consider when proposing and developing a marina, particularly at the design and construction stage.

Today over 50 marinas within the National Park System provide a variety of services, including slips, moorings, fueling facilities, sewage pump out stations, storage, repair services, food services, etc. They vary considerably in terms of scope of service, design, operational problems and profitability.

During the last few years, some park marinas have flourished while others have had to face, or skirt, financial failure due to combinations of planning, design, market and operational problems. Some of these problems could have been avoided, while others were more unpredictable.

The primary objective of the marina chapter is to impress upon park managers and planners the complexity of a marina, and then to provide some basic information along with resources for assistance.

PLANNING AND DESIGN

The 1959 edition of Charles Chaney's standard text, Marinas: Recommendations for Design, Construction and Maintenance, consists of 26 chapters with over 350 individual topics listed in the table of contents. This provides an indication of the complexity of developing and operating a marina, particularly in the design stage.

This section will provide some insight on recognizing the prominent variables one must consider during the planning and design cycle of developing a marina, as well as financial feasibility considerations at this stage of the life of a marina.

Planning

The planner and the engineer must work closely together from start to finish of the planning/design function. Because of the difficulty in separating marina planning and design, information on planning and design will overlap, although they will be presented from different perspectives.

Initial "planning" efforts will probably be in the form of development concept plans, concessions management plans, resource management plans, water activity capacity studies, etc. As with any other concession planning effort, the question of whether a marina is necessary and appropriate must be considered early in the planning stage. As part of this effort, a market study should be conducted as discussed later. This will lead into the consideration of site selections. At this point, planning and design meld together somewhat because of the technical engineering considerations required in site selection.

These recommendations are derived from the averages of boat sizes produced in the United States in 1984. The production there of the new "wide body" boats (a 25-foot-wide-body boat may have a beam of as much as 11 feet), is having a significant effect on slip sizing. As with most averages, there will be the occasional exception. The tabled sizes will accommodate more than 90 percent of all U.S. boats short enough to fit each of the slip lengths. Slips sized by the table will accommodate both sail and power boats. If a marina is to be designed only to accommodate sailboats, the slip widths shown in the table for slips longer than 9 meters and less than 15 meters may be reduced by 0.3 meter in width. Sailboat slips longer than 15 meters but less than 21 meters may be held to a 4 meters width for floating slips and to a 4.5 meters width for fixed slips.

Walkway Dimensions

The minimum width recommended for main, marginal, and tee piers in any marina is 2 meters. Finger piers should have a minimum width of 0.6 meter; a 1.0 meter width is preferred.

It has been observed that while narrow walkways may be structurally satisfactory, they still cause a certain amount of psychological unease on the part of the marina patron. This is particularly true of finger walkways on fixed systems where the user winds up precariously balancing on a rickety narrow platform high above the water. The problem is significantly reduced for systems whose decks are close to the water, as with floating systems. Generally, increasing the width of walkways tends to increase their stability. On the other hand, as noted above, unit of walkway area will cost the marina operator unrealized income.

The operational philosophy of the marina will also affect the recommended walkway widths. In a private marina catering to boats shorter than the order of 12 meters, there is only one reason for specifying main walkways wider than 2 meters, and this would be the need to drive golf carts, honey wagons and the like along their length.

For marinas catering to larger boats, for public marinas where there is likely to be a substantial amount of pedestrian traffic not related directly to boat ownership, and for marinas where there is likely to be light vehicular traffic, the minimum recommended walkway width is 2.5 meters.

Marinas which can anticipate large crowds, as for a boat show, should have minimum walkway widths of 3 meters.

Except where automobiles, trucks, or mobile load handling machinery will be used, there is no rationale for marina walkways whose width exceeds 3 meters.

Planning efforts for lakes and rivers should consider a carrying capacity study to predetermine the number of boats that would be allowed on a specific body of water, in particular, where you have a houseboat rental program and multiple concessioners.

As stated by one expert in marina design, "As one travels a relatively short distance, in any section of our country, marina installations vary as to layout and structural design to an extreme almost beyond belief."[1] For this reason, it is about impossible to prepare a complete, concise list of marina planning and design standards, standard layouts or even a list of all of the variables to consider (at least without preparing another textbook) for every potential marina site.

However, it is important for managers to be aware of the primary impacts and design considerations that planners and designers must consider. Therefore, two papers by recognized marina authorities have been included in the appendix. In Appendix A, a paper[2] has been included which discusses environmental impacts of marinas and boats. Topics include marina site location, dredging, bulkheads, breakwaters, piers and docks, marina use and boat sewage. It provides a useful introduction to these planning considerations.

Design

Once beyond (or well into) the site selection process, one needs to consider other design concerns such as slips (size, covered vs. open, arrangement), mooring buoys and mooring fields, structures (on piling or floating), cable and anchor-type facilities, utilities, breakwaters, shoreside facilities, fire protection, etc. Again, each marina will dictate a new design because of its unique setting, climate, weather (especially temperature and wind) and clientele mix.

A paper[3] has been included in Appendix B, which considers recommended guidelines for marina designers. Topics include the basic layout of marina slips, walkways, marina basins, fueling facilities and shoreside facilities. There are probably some differing opinions on the recommended actions included in the paper considering the many different environments where marinas are located within the Park System. Also, both papers appear to stress pier construction, while many park marinas are on floating structures. However, these topics must be addressed, hopefully with the assistance of a qualified designer/engineer, and this paper will provide some insights into these areas.

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[1] "Accepted Guidelines of Marina Layout," Robert E. Knouff, Manager, United Flotation Systems, United McGill Corporation, Columbus, Ohio, 1977.

[2] "Environmental Impacts of Marinas and Their Boats," Neil W. Ross, Marine Recreation and Boating Industry Specialist, Marine Advisory Service, Sea Grant, University of Rhode Island, 1985.

[3] "Recommendations and Guidelines for Marina Designers," W. C. Johnson-Chamberlain, Waterfront Consultant, Warzyn Engineering, Madison, Wisconsin, 1985.

Feasibility

The feasibility of a marina project must include a number of considerations. A feasibility determination process is not only useful when developing a marina, it can also be helpful in trying to determine the cause of a later marina financial problem. A feasibility study usually consists of a market analysis, a site analysis and a financial analysis.

The study will probably be initiated because of a perceived demand. This demand should be examined by conducting a market study prior to beginning a site analysis and other technical studies. The study will determine whether there is sufficient interest in a marina, where the users will be coming from, the types of services and facilities which are desired/needed, the size of the marina, etc.

The site analysis involves a very close examination of physical characteristics of a proposed site as well as esthetic considerations and the site's relationship to population centers, roads, support facilities, etc. For each site, one must consider weather patterns, wind direction and intensity, wave action, topography, soils, dredging and disposal, breakwaters, launching areas, area for parking and shoreline facilities, etc. From these initial analyses, preliminary cost estimates must be prepared.

Once the site is selected, development constraints and opportunities, seasonality and various design alternatives should be considered in order to examine the financial feasibility of the project. Information will be necessary on projected income and expenses, construction cost estimates, sources of income and construction phasing. This will translate into projected annual profit or loss and the return on investment.

If the marina is to be a joint effort on the part of a concessioner and the National Park Service, a determination must be made as to the amount of investment the concessioner can be expected to make and if the Service can realistically be expected to fund the balance.

Pro formas. Appendix C will provide a sample pro forma which can be used to project the feasibility of the proposed marina. It should extend over at least a three-year period to provide some indication of the project's feasibility beyond the opening year, the point when it will begin to produce a net income and the cash flow needed to carry the marina through its first few years.

Profit centers (slip rentals, boat rentals, store(s), equipment sales, food service, gasoline, repair services, etc.) should be clearly delineated in the pro forma. It is highly probable that some profit centers will be necessary to offset other activities which will be unable to show a consistent profit. Overhead costs (Administrative and General) must also be examined most carefully, along with ever increasing insurance costs (and problems of availability).

OPERATIONAL CONSIDERATIONS

Fire Protection

Every superintendent in areas with marinas must be well versed with NFPA 303, the Fire Protection Standard for Marinas and Boatyards (1986 Edition). The standard includes fire protection, berthing and storage facilities, operational hazards and electrical wiring and equipment. Areas with facilities used to transfer people and/or cargo between vessels and land should refer to NFPA 307, Standard for the Construction and Fire Protection of Marine Terminals, Piers and Wharves (1985 Edition). It is suggested that park managers, visitor protection and maintenance personnel receive some training in the content and application of these standards to their specific marina or marine terminal operations.

Utilities

Guidelines on the design of utilities at marinas are currently being developed by the NPS Operations Engineering Office in Denver. They should be available late fall of 1988.

Operational Standards

NPS-48, Concession Guidelines, provides specific standards for marinas in the areas of rates, rental operations and dock operations (Standard No. VIII), vessels (Standard No. VII), and boat rentals (Standard No. XVIII). General standards for facilities, operations and rates are also provided. These standards should be taken into consideration when planning and designing a marina.

Rates

A review by the DSC Concessions Branch of concessioner marina rates illustrated the differences in marina design and operations. The design of marina slips may affect rate determination, as will the extent of auxiliary services provided at the marina.

Additional information on marina rates can be found in Appendix D, including some general observations, which could be useful for marina planning.

FINANCIAL CONSIDERATIONS

Marinas in the National Park System generally fight the same uphill battle as other marinas do to maintain adequate profitability. The larger and/or year-round marinas will tend to fare better, while others have yielded rather low returns or have had difficulties in meeting payments on their investments. Potential financial return is a critical consideration not always heeded during the marina planning process.

There are several potential causes for low profit situations: either over-development or under-development; too much dependency on slip rental with little or no attention to other profit centers; a lack of adequate marketing (or ill-defined target markets); lack of adequate capitalization making it difficult or impossible to meet later installment or balloon payments; adjustments in water levels at reservoirs necessitating relocation or extension of ramps, docks, etc.; poor management and maintenance practices, etc. Some operators may be in the business mainly for lifestyle considerations, and are more interested in being around a marina than making a profit. In all cases, the Service must be assured that quality of service and facilities will not suffer.

These possibilities demand a close vigil on the part of the Service of the concessioner's financial situation. This can be accomplished through an annual review of the concessioner's annual financial report, noting year-to-year income and expenses, and any noticeable trends. It is noted that many marinas gross less than $100,000, and only have to submit the short-form AFR's. Parks should contact their regional concession office if they feel a need for additional financial information.

Nationwide balance sheet, sales, profit and financial ratios (solvency, efficiency and profitability) are available, but must be used very cautiously. National Park Service marinas vary enormously in size, seasons, and types of services offered. However, attempts are being made to develop more park specific indicators for use in analyzing marinas financially. Also, national financial ratios for marinas and boatyards are compiled by the University of Rhode Island's Marine Business Financial Data Bank, and are available by contacting the DSC Concessions Branch.

The primary point to be made here is to quickly notify the regional office if it appears a marina operation is undergoing financial strain. This may become apparent because of a concessioner's inability to meet operational and maintenance standards or contractual requirements and improvements, its inability to make franchise fee payments, or as a result of an end-of-the-season close-out session with the concessioner. In any case, assistance is available to help park managers in evaluating the cause(s) of the financial problem and providing recommendations for improving the situation by contacting their respective regional concessions offices.

RESOURCES FOR PARK MANAGERS

Various resources are available to park managers desiring assistance with marinas. One particularly useful publication is *Marinas: Recommendations for Design, Construction and Management*, Volume I, Third Edition, (1983), by W. Clinton J. Chamberlain. It is published by the National Marine Manufacturers Association (NMMA), and includes such diverse topics as site selection, planning, layout, financing, permits, construction, management, accounting, boat handling equipment, dry storage, maintenance and insurance. A second volume is forthcoming covering the technical aspects of marina design, engineering and construction, and both volumes will also be published as one book.

The following bibliography includes other recommended publications on marina planning, design and financial analysis.

Other materials can be obtained from state marina associations, universities and state offices. Examples include the "Recreational Boating Facilities Directory of Architects and Engineers," NMMA; "Layout and Design Guidelines for Small Craft Berthing Facilities," State of California's Department of Boating and Waterways; "Marina Development Handbook for Washington," Northwest Marine Trade Association; newsletters/studies and seminars sponsored by state marina associations; and various studies prepared by universities such as Texas A&M University. State marina associations can provide information on available resources such as the examples listed.

The annual "Docks and Marinas" conference sponsored by the University of Wisconsin Sea Grant Institute is highly recommended. The week-long program (which is usually held in October) includes presentations on general marina planning and design, economic analysis, docks, breakwaters, and various technical topics. Contact the DSC Concessions Branch for further information.

Assistance in reviewing planning, design, operational, financial and rate issues can be provided by the DSC Concessions Branch through requests from regional offices.

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APPENDIXES

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ENVIRONMENTAL IMPACTS OF MARINAS AND THEIR BOATS

Neil W. Ross[1]

INTRODUCTION

Any changes to the shore area may be assumed to have environmental impacts. Marinas are shoreside facilities for servicing recreational boats which alter the coastal area and thus are capable of having complex impacts, both positive and negative. In this paper, "marina" refers to facilities also called boatyard, moorage, dockominium, yacht club, community dock, town dock, etc., serving ten or more recreational craft. Defining and measuring the impacts of any marina require that each component be first viewed individually, and then as part of the whole ecosystem (include biologic, physical, social, and economic values).

In addition to environmental effects, marinas have importance to society. All marinas, even those which are privately managed (the majority in the USA), are major access points for the public getting to and from recreational waters. As such, marinas should be broadly recognized as being in the public interest and be considered as a priority use for the waterfront by government planners and managers.

My concept, gaining recognition in both the public sector and the boating industry, is that each marina and launching ramp is like the narrow neck of an hourglass of public access. On one side are the recreational waters, while the other side finds the citizens wanting to go boating with the boats and related products from a major industry (1984 US sales = $12.3 billion). The narrow neck is the access point . . . as it expands or contracts so do the number and frequency of boating opportunities. Recent US coastal trends suggest that the number of marinas is decreasing in some areas (i.e., Florida and Connecticut) while almost all boating areas report an unmet demand for boat slips. This is a challenge for coastal management agencies, land developers, and the boating industry.

The boating businesses have economic values to local communities by importing tourist money from a wide geographic range, which results in employment, profits and tax revenues. At the same time they place limited demands upon the community's services and revenues. Coastal and shoreline tourist areas have enhanced value when boating activities are involved, both to the boater and to the non-boater who enjoys watching the boating scene. Waterside residential developments find marinas to be a keystone to marketing the housing units. Decayed and underused urban waterfronts are being revitalized with marinas as a major attraction and interaction point with the waters. Thus in those cases the boating activity gives a "value added" impact to the economy, esthetics, tourism, and recreational opportunities.

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[1] Marine Recreation and Boating Industry Specialist, Marine Advisory Service, Sea Grant, University of Rhode Island. Presentation at the 1985 University of Wisconsin Docks and Marinas Conference. (Currently President, International Marina Institute.) Reprinted with permission of author.

Marinas, like commercial fisheries, are "water dependent" uses which can only be located along shores. Coastal planners should distinguish them from "water enhanced" facilities (i.e., condominiums, parking lots, office buildings) which can be located elsewhere. Marinas also concentrate boating activities, storage, and access, thus freeing shore frontage for environmental protection or other uses.

All the environmental impacts of marinas and their boats here reported are relatively minor, when viewed in comparison to man's other alterations of the shoreline and effects on water quality, but cannot be ignored.

MARINA SITE LOCATION

The location, preparation, and design of marina facilities (includes planning for vehicular traffic, access to navigable waters, fresh water supply, and utilities) are the first factors to be considered when assessing the impact of a marina. The primary negative impacts are habitat loss, pollution by storm water runoff, and aesthetic (visual) pollution. A marina's impact can also have positive features, since it provides for the concentration of shoreline development (as opposed to many scattered private docks) and may increase the diversity of shoreline habitat (e.g. providing substrate for fouling communities).

When building a new marina or expanding an old one, the optimal choice would be a storm protected area of shoreline that does not include salt marsh or wetlands. This option is often not available. Guidelines for marina development in a marsh environment and to maintain biological productivity include:

1. Use dredge material from the marsh to establish new productive marshes elsewhere;

2. Provide adequate flushing to promote water circulation, which cycles nutrients and prevents eutrophication;

3. Provide contact areas within the marina so fouling communities, an organic food source, can prosper and multiply;

4. Control water quality so that estuarine species can thrive in the marina.

Sloppy construction site management can cause a major problem to adjacent wetlands and marshes, especially from vehicular traffic, soil erosion, filling and debris litter.

Fouling communities in marinas may actually complement neighboring salt marsh systems by serving as an important food supplement for juvenile and adult finfish, particularly at seasons when marsh nutrient export is lower. Although those fouling communities contribute to biological production, they may not adequately replace other valuable components of salt marsh ecosystems. Some wildlife species, such as mallard ducks, which have adapted to man's presence, may be able to utilize marina areas. To maintain fish and wildlife habitat, as much marsh area should be retained as is possible at the marina site.

Retaining marshland along the water margin of a marina will provide a natural buffer to storm water runoff and prevent the release of untreated runoff directly into marina and coastal waters. Acceptable alternatives to pavement are crushed stones or shells. If a marina is designed with as much porous land surface and vegetative cover as possible (i.e., grassy swales, settling ponds, lawn edgings, ground cover and flower beds, natural buffer strips), storm water runoff and its impact may be significantly reduced.

A pleasingly landscaped and well-kept marina is also an important consideration for the maintenance of the beauty of the area. Ill-kept and sloppy marinas may discourage business and create safety hazards, making poor economic sense for the marina operator, and often is a root cause of neighborhood objections to permits for expansion. A good reference which considers landscaping is Marinas: A Working Guide to Their Development and Design by Donald Adie.

DREDGING

A wealth of literature has been published regarding the effects of dredging and dredge material disposal, but most of those studies are concerned with the large volume dredging of commercial river channels and ship ports, rather than smaller volume, recreational boat basins. For this reason, the specific effects of marina-related dredging are difficult to define and thus are often misrepresented to the public by appearing to be of larger scale than they are.

The waters of many marinas are not deep enough for all recreational craft, and, therefore, sites are often dredged during their initial construction. However, the most common dredging practices in marinas are low volume "spot" and maintenance dredging to remove sediments from small problem areas in boat channels or near docks.

The major negative impacts of marina dredging include:

- Turbidity
- Temporary reduction of oxygen content
- Burial of organisms
- Disruption and removal of bottom sediments
- Change in benthic community characteristics

Many investigators conclude that those temporary impacts to local waters have not represented significant long-term negative impacts on the environment. Within two months after being dredged, bottom areas recolonized with benthic communities similar to the original. Marina dredging has not been found to have permanent term decreases in marina water quality.

"Creation of stagnant water conditions" is a "popular" anti-marina claim heard at public hearings, and possible water stagnation in marinas with dead end canals has been mentioned in the literature, but no specific location was cited. It is presumed that such descriptions may apply only to areas with the extensively dredged Venetian canal developments common in Florida. In semitropical and tropical waters, the normal high temperatures and low oxygen levels in the water may be a concern which should be studied.

Dredge Material Disposal

The effects of dredge materials on the environment is relative to the nature of the sediments (whether or not they contain toxic substances) and the selection of the dump site.

Positive Effects of Dredging

Dredging does not always have adverse effects. It may help to improve circulation in choked inlets, increase the availability of food to fish and shellfish, and help to flush and dilute polluted waters. Dredge materials have successfully been used to nourish beaches, build salt marshes, and create islands suitable for colonization by important bird species.

Marina designers may reduce or eliminate the need for and cost of dredging by good planning. For example, slips for boats of deep draft should be built in the naturally deeper waters of the marina, and piers and docks should be extended as far as possible into deep water to minimize the need for dredging around them. If maintenance dredging is expected, the plans must include a choice of sites for disposal of dredge materials. These materials may be spread on the surface of parking lots or storage areas, or even used to build salt marsh, on or adjacent to the marina shoreline. When dredging must be employed, it should be planned to prevent dead-end Venetian channels and restricted inlets. Flushing should be encouraged by increasing the width and depth of the marina channels or canal out into navigable waters.

Bottom community and sediment characteristics should be taken into account and the dredging timed so as not to conflict with critical periods in the life cycle of important animal species. Reduce the impact of temporary oxygen reduction by dredging in colder months, when oxygen concentrations are not critical. The impact of dredging on coastal and estuarine environments is site-specific.

BULKHEADS

Bulkheads are vertical, walled structures built parallel to the shoreline to protect it from erosion or to provide boat docking convenience. They are usually made of stone, concrete, sheet metal, or treated wood. The most severe effects of bulkheads occur when they are constructed within or along the shores of wetlands and used to hold fill deposited on the wetland. As well as preventing free water circulation to any wetland behind it, a bulkhead can also prevent the natural seepage of groundwater into local waters.

Bulkheads are expensive to build and for that reason should be kept to a minimum. If erosion on the marina waterfront is a problem, a sloping riprap wall with underlying filter cloth is the preferable form of shore protection. Riprap walls can be less expensive, provide more surface area for the growth of fouling communities, and create habitat for fish fry. Problems of scouring and wave reflection are less severe than vertical walls because riprap surfaces are irregular and sloping. Reflected waves may also result in increased marina maintenance costs and discomfort for pleasure boaters. Sloping beaches and marshes are effective wave energy dissipaters.

Since a riprap wall is not solid, it allows seepage of ground water into the marina. In solid bulkheads, features such as "weepholes" will allow water to pass through. Sloping riprap walls do require more space than vertical bulkheads, and space limitations or specific marina services (e.g., travel lift wells) may preclude their use. If bulkheads or riprap walls are deemed necessary, they should be located behind all marshland and as far upland as possible with access over wetland on piers.

BREAKWATERS

Breakwaters are linear structures which extend out into the water and provide sheltered conditions for craft and marina facilities by dissipating wave energy. They may be composed of a wide variety of materials (stone, concrete, metal, wood, tires, fiberglass) and constructed to either sit on the bottom (fixed position) or float on the surface (movable).

Breakwaters can be traps for larger floating debris (bottles, boards, bags), which becomes an aesthetic problem as well. A California breakwater accumulated enough organic debris which resulted in the depletion of dissolved oxygen in the bottom water, which harmed the benthic fauna.

Breakwaters can also interrupt longshore currents and the movement of sediments. Restricting the opening for water circulation within a marina, will alter sedimentation patterns and the natural flushing which can help remove pollutants from marina waters. No reports were found which have attempted to quantify this effect. Some breakwater designs can act as barriers for migrating juvenile salmon.

A floating breakwater can be less expensive and an environmentally sound alternative to the common, solid breakwater. The floating breakwater allows free passage of fish without significantly altering current and sediment patterns, and therefore does not have the adverse effects of a solid breakwater. However, it cannot provide the same degree of protection and must be considered a temporary, not long term structure.

When solid breakwaters are used, their location must be planned with consideration of natural current and sediment flow, wave patterns, and overall flushing characteristics of the marinas, or to remedy problems at existing ones. Sloping riprap type breakwaters are preferable to vertical structures because their irregular surfaces provide protective habitat for small fish passing around the structure and are more effective in dissipating wave energy. Since breakwaters provide calm water, they may also increase the amount of shoreline available for salt marsh building. The fouling communities which grow on breakwaters can add to the biological productivity of the area and attract fish.

PIERS, DOCKS, AND WHARVES

Piers, docks, and wharves can have detrimental effects on both salt and freshwater marshes by blocking light and water flow. As happens with bulkheads and breakwaters, water flow within the marina basin may be altered, especially if piers are supported by closed (solid) bases.

The negative effects of docks, piers and wharves can be reduced if they are constructed high enough above marshes to allow light to reach the surface. These structures should also extend out far enough to reach adequate water depths so that dredging is minimized. Floating docks and pile/timber piers will have the least effect on water circulation, thus should be considered in preference to solid structures. Because these structures provide additional substrate for fouling growth, marina operators should avoid painting the underwater surfaces with anti-fouling paints.

Wood, a major component of many piers, pilings and docks, is usually treated with a preservative of a poisonous nature and of low water solubility (such as creosote, copper napthenate, or various copper and zinc salts) which discourage the establishment of fouling organisms and dry rot. Further studies on the environmental effects of wood preservatives are necessary, but, until results are available, their use should not be banned. Meanwhile, prudent use of longlasting material should be encouraged (i.e., pressure treated, "greenheart" piles and lumber, metal, fiberglass, or concrete).

MARINA USE

There are many activities associated with regular marina operations which may affect the local environment. Nearly all marinas have rest room facilities, and a small number have facilities for pumping out the holding tanks of boats. Often municipal sewer systems are not available, thus the marina must have its own septic sewage system. Overloaded or poorly located septic systems may allow sewage effluents to leach into marina waters, causing an increase in the nutrient supply, biological oxygen demand, and potential disease contamination.

Fuel Docks

Fuel Docks may also be a source of pollution through small but numerous oil spills of gas and diesel fuel. These spills can be minimized by equipping fuel pumps with back-pressure, automatic-shutoff nozzles, which reduce fuel overflow. Constant maintenance of pumps, hoses and other fueling equipment by careful fuel attendants will also help reduce spills. Similarly, sloppy paint maintenance practices with paint dripping into the water may also contribute to the pollution of marina waters.

Noise

Marina and boat activities can result in noise disturbances. Boat engines contribute to noise, but this disturbance is limited to brief periods when boats leave or enter the marina. Noise levels from outboard motors have been reported to reach a maximum of 80 decibels at 50 feet. This is not a high level, however the annoyance factor of different types of noise is variable from listener to listener. Another noise typically associated with marinas is the incessant clang of sailboat rigging, which can be remedied by use of tiedowns. Unnecessary disturbances, such as loud televisions, radios and stereo sets are usually the most annoying. Since sound travels easily across the water, marina operators should show consideration for neighbors as well as customers by posting and enforcing rules against unnecessary noise.

Littering

Littering (the chronic by-product of man and principal resource for archeologists) can be discouraged by providing strategically placed and frequently emptied trash receptacles, convenient for boater use. Strong management policies and social pressure from other boaters is the most effective form of litter control.

Auto Traffic

Auto traffic is another concern, especially for neighbors on roads leading to marinas. Auto parking ratios larger than 0.5 cars per boat are not recommended unless other attractions (i.e., restaurants, bars, etc.) are present.

BOAT SEWAGE

Although human sewage from boats can be a repulsive visual pollutant and contribute to the biological oxygen demand of marina waters, the primary concern is its potential for carrying disease-causing pathogens. Problems may occur if boat sewage is released into freshwater used for drinking water, or into enclosed waterways with limited flushing, or in the vicinity of saltwater shellfish beds. Ingestion of disease organisms is the real concern, whereas the question of swimming in mildly polluted waters is more an emotional deterrent than a medical hazard. At present in the USA, total and fecal coliform counts are used as indicators of sewage pollution in waterways.

Urine is sterile, thus poses no health hazard in boating waters.

Regulations concerning boat sewage can be difficult to enforce; thus other management tools are still necessary. Every marina can reduce onboard toilet use by providing dockside rest rooms that are convenient, warm, clean, and provide hot water for showers. Reasonable guidelines for the required number of dockside toilets need to be established based on the capacity of the marina and its use characteristics . . . not on those standards used for hotels or homes.

Boat wastes are of concern primarily in enclosed inland water and semi-enclosed coastal waters where flushing is minimal. Public education and peer pressure can be used to discourage feces discharge overboard in or near the marina, beaches, and shellfish beds. Once boats are underway and outside in bays, river channels, or the ocean, any sewage discharged overboard is readily diluted (billions to one) and has a negligible impact. Masceration of the feces into smaller pieces is recommended first.

Shellfishing should be allowed around marina waters during nonboating seasons. Shellfish quality should be routinely monitored to provide the basis of closure, if necessary.

United States Coast Guard and Environmental Protection Agency regulations on marine sanitation devices (MSD) are relaxing due to lack of enforcement and a more realistic view of their limited impact. Not all boats in the US contain installed heads, and those that do may use Type I or II flow-through MSDs, which do not require pumpout. Type III MSDs have holding tanks. Therefore, only selected marinas, in harbors with large numbers of boats containing heads, need to have pumpout facilities available. Most marinas with holding tank pumpout facilities report very low levels of use by boaters.

The overboard discharge of "gray" water (i.e., galley and shower waste water, soap, and grime) has considerably less impact than boat sewage and creates little or no threat of shellfish contamination or water quality. Until scientific research proves otherwise, discharge of "gray" water does not need regulation.

[Editor's Note: It has been reported that in certain situations, gray water may affect water quality. In fresh water lakes, where inlets and coves provide good harbor for overnight pleasure boats and houseboats, water quality can be affected. Houseboats now provide showers, galleys, dishwashers, as well as floor mopping and general cleaning, all of which require the use of detergents and soap which are probably not biodegradable. Many of these coves and inlets have poor circulation and shallow water. When they are visited hundreds of times throughout the summer months, water quality could be altered.]

RECOMMENDATIONS AND GUIDELINES FOR MARINA DESIGNERS

W. C. Johnson-Chamberlain[1]

ABSTRACT

The proper location and sizing of the elements of a marina can affect the original construction costs, the efficiency of the operation, and the psychological and physical well-being of marina personnel and patrons. Standards whose practicality have been tested in the United States are offered for appraisal by designers who practice in other parts of the world. These standards are based on more than 15 years of marina design experience.

INTRODUCTION

After a good many years at the game, the author finds that the one universal criterion for evaluating a marina design is the marina's economic performance; this applies to both privately funded facilities and government funded facilities. While governments may utilize reasons such as "benefit for the general public" to justify the investment, the fact is that government funded facilities still cost money to build and operate. Even where no fees are charged, the responsible government agency must design, build and operate the facility; evaluation and minimization of the net cost apply - or should apply - to the public facility just as much as to the privately owned entrepreneural facility.

Over the years, application of this criterion, and those common to good engineering, has produced the compendium of recommendations which follow.

BASIC LAYOUT OF MARINA SLIPS

The commodity that a marina sells is water area. Each unit of unused water area reduces the total income potential of the marina, or causes the unit cost of the marina to rise. Designs which call for excessive walkway widths, or fairways which are wider than necessary, remove saleable water from commerce and are examples of poor practice. At the same time, if fairways are too narrow, if the boats are crammed into narrow slips and their transoms stick out beyond the ends of the fingers or the outer piles, it is inevitable that boats will be damaged, patrons will generally abhor the mess, and the efficiency of the marina will be severely compromised.

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[1] Senior Waterfront Consultant and Project Manager, Warzyn Engineering, Madison, Wisconsin. Presentation at the 1985 University of Wisconsin Docks and Marinas Conference. Reprinted with permission of author.

Maximum Number of Slips

In experienced designers often over estimate the number of boats which can be placed in any particular marina basin. The question is particularl important during the preliminary evaluation of an interesting site. Using slip widths from Table 2, a main walkway width of 2 meters, an allowance for fingers or mooring piles of 1 meter per boat, and a fairway width of 1.5 times the longest slip adjacent to the fairway, one gets a simplistic table of the maximum number of slips per hectare for various lengths of boats in fixed and floating structures as follows:

TABLE 1
MAXIMUM NUMBER OF SLIPS PER HECTARE/ACRE

Boat Length		Maximum Number of Floating Slips per:		Maximum Number of Fixed Slips per:	
Feet	Meters	Hectare	Acre	Hectare	Acre
23	7	186	75	151	61
30	9	115	47	107	43
36	11	85	34	78	32
43	13	73	30	66	27
50	15	54	22	49	20
56	17	48	19	43	17
62	19	41	17	36	15

Recommended Slip Sizes

Boats moored in fixed slips in tidal waters must have room to move against the mooring lines as the water level changes. For this reason, fixed slips in tidal waters should offer a minimum of 0.5 meter to 0.75 meter clearance on each side of the moored boat. Larger boats will require the greater clearance.

Boats moored in floating slips and boats moored to fixed slips in non-tidal waters can be tied tightly to the slip structure and clearance is needed only to allow for entry into the slip and to allow for wave induced motion of the boat. Accordingly, these slips may be narrower.

Based on statistical data from a number of sources, the following slip sizes are recommended:

TABLE 2
RECOMMENDED SLIP WIDTHS FOR VARIOUS SLIP LENGTHS
(All Dimensions in Meters)

Slip length (meters)	7.0	9.0	11.0	13.0	15.0	17.0	19.0
Width, floating slips	3.4	4.0	4.3	4.6	4.9	5.8	6.1
Width, fixed slips	3.7	4.4	4.8	5.1	5.5	6.8	7.1

[Editor's Note: A recent marina walkway concept has been developed whereby the floating laminated walkways are designed to not only serve as walkways but as a protective breakwater as well. They are 12 feet wide and graduate to 17 feet wide. Another "headwalk" design is made of I beam construction and acts as a stabilizer for the marina. This headwalk can handle an inordinate amount of foot traffic, from activities such as tour boats, restaurants and gift shops, boat rentals, shower/restroom facility, etc.]

Finger walkways may need to have widths greater than 1 meter for stability (floating systems) or for structural strength and rigidity, but widths greater than 1 meter are not needed for the benefit of the boat owners. Given that the finger is rigid and does not wobble, and that it is strong enough to sustain the loads placed upon it by docking or moored boats, it need not be more than 0.6 meter in lengths of less than 5 meters, 1 meter wide in lengths of less than 15 meters.

Full length fingers are widely accepted by boat owners and permit bow-to mooring. Where stern-to mooring is used, however, the fingers need only be long enough to lap a convenient boarding location on the boat, usually the stern quarter. However, short finger walkways commonly used with fixed construction require a pile at their outer end. Use of the spring pile for support of a finger walkway is not good practice but it must also be realized that driving the extra piles is expensive. As always, some sort of balance between the two arguments must be sought.

Many boats may be boarded over the stern with relative ease, and the designer may want to exclude the use of finger walkways altogether. However, backing into a slip places a significant demand on boat maneuverability and on the operator's skill. At the least, wider slips than recommended above will be required.

Slip Arrangement

The actual arrangement of slips in a marina involves a trade-off among walkway dimensions, slip dimensions, fairway widths, variable water depths, and so on. It is also necessary to take into account such factors as the direction and intensity of currents, and the prevailing directions for normal and storm winds and waves.

The primary guideline for slip layout is that the slips should be oriented parallel to the current, never broadside. A secondary guideline is that boats must be tied to the four corners of a slip. An exception: in some circumstances boats may be safely moored by tying ONLY one side to a floating finger pier. Subject to these constraints, the following have served well:

- Slips are arranged at right angle to the main walkway and main walkways are oriented as nearly as possible at right angle to the shoreline.

- Insofar as possible, slips are arranged symetrically by width on either side of a main walkway. That is, an 18-foot-wide slip is located opposite an 18-foot slip, a 16-foot slip is placed opposite a 16-foot slip, and so on. This is such a basic element of good structural design that where possible the slip widths should be adjusted to accommodate the principle. Thus, if it is necessary to place 45-foot-long slips having a width of 18 feet along one side of a walkway, and on the other side of the walkway it is necessary, for whatever reason, to use slips that are only 35-feet long, the 35-foot slips should also have a width of 18 feet.

- A "tee" pier should be placed at the end of a main walkway whenever possible. If nothing else, the tee will serve as a good place to accommodate transients. If the slip design incorporates one of the several types of floating structures that we will accept for our clients, tee piers also provide a significant wave damping action, thus protecting the boats on the interior of the structure.

- If a mix of slip sizes is to be used along the walkway, the smaller slips should be placed toward the shore. This allows the fairway to be widened as it approaches the shore with resulting gains in maneuvering space.

- Main walkways less than 100 meters long are designed to be straight. If at all possible, walkways longer than this should be designed to have a small angle or a jog at about the halfway point. This is a psychological factor; a long pier appears to be much longer than it really is and the bend or jog reduces this impression. The author likes to place service islands on widened sections of walkway to effect the visual discontinuity.

- Curved walkways or any sort of curvilinear arrangement of slips are forbidden. These are always expensive to build and maintain, are conducive to boat damage, and are wasteful of water space. There can be no justification for their inclusion in a marina layout. Mooring spaces along a curved bulkhead are particularly bad. Such arrangements are often introduced by architects or landscape designers for esthetic reasons which have nothing to do with the practical aspects of marina operation. They should receive short shrift from the person who is spending the money.

Use of Double-Wide Slips

Double-wide slips - that is, slips which contain two boats without separating piles or finger piers - allow mooring flexibility and save water space and money. However, boats moored in double-wide slips are more prone to being bashed by careless operators of the "other" boat and are more difficult to protect, one from another, when wave action causes the moored boats to have significant rolling action.

Double-wide slips for floating structures are quite practical so long as the finger walkways extend for the full slip length, thereby permitting the boats to be tied tightly to the adjacent finger, and so long as the slip length does not exceed about 11 meters. They are not practical for fixed-pier moorings in tidal or fluctuating waters - a mooring pile and a spring pile between boats will be required.

Use of double-wide slips for boats much larger than about 11 meters LOA is not recommended. When boats reach this size their inertia becomes large enough that significant boat-to-boat (or boat-to-walkway structure) damage can result if the boat is in the hands of a careless or unlucky operator.

When considering double-wide slips, the marina designer should note that lateral stress on finger walkways is significantly increased since each finger must sustain fully the stress of the two boats tied to it - normally a finger walkway is stressed by only one moored boat.

Use of Mooring and Spring Piles

Where mooring piles are used for slips longer that about 7 meters, there should be one pile at the outboard end of the slip and another approximately at the midpoint. The middle pile is called a "spring pile" and is used to help restrain the fore and aft motion of the boat and to provide some protection between boats in adjacent slips. The spring pile should have the same driving specifications as the mooring pile.

Bow-To Mooring

From an operational viewpoint, it is best to moor all boats bow-to rather than stern-to since most boat drivers can aim a boat fairly well when going ahead. This is only feasible however when finger piers extend past a convenient boarding point on the boat. Full length finger piers are desirable and while the initial expense is greater, it is our experience that in the long run the expense will probably be justified in terms of customer acceptance (meaning higher fees) and in terms of reduced damage resulting from careless docking.

Fairway Dimensions

For most circumstances we find that a fairway between rows of slips can be 1.5 times the length of the longest slip. Where a row of slips faces a breakwater or some other obstruction, the distance between the outer ends of the slips and the obstruction should again be 1.5 times the length of the longest slip. Fairways should never be less than 1.25 times the length of the longest slip, and fairways greater than 1.5 times the longest length are nice but are not normally necessary.

Strong current is the one factor which may affect these recommendations. Where current parallel to the long dimension of the slips exceeds two to three knots, even temporarily, maneuvering to put a boat down-current into a slip can be quite difficult. In this case it would probably be wise to widen the fairways to twice the length of the longest slip.

Note that the above guidelines assume that no boat will be longer than the slip in which it is placed. The practice of locating boats in slips shorter than the boat is a sure sign of poor management.

The Marina Basin

Square corners, a constant depth and parallel, and vertical walls all contribute to generation of standing waves inside the basin and to poor flushing action. As a consequence, boat motions become intolerable, trash collects, water stagnates and minute input of pollutants will tend to build to unsatisfactory levels. Instead, both experience and physical model testing show that basins should have as few vertical walls as possible within the operating context, that the walls should not be parallel or straight, and that interior corners should be gently rounded - preferably with constantly changing radii.

Although there are some recreational boats with drafts of as much as 15 feet, these tend to be very much in the minority. Generally, a maximum basin depth of 12 feet has been found quite adequate, and most basins can be much shallower. In any event, the bottom should be sloped toward the exit and toward the waterway outside the marina. The general design standard that has been useable for most cases is:

- Depth at the interior perimeter of the basin, 1 meter MLW minimum
- Depth at the ends of the main walkways, 2.8 meters MLW, typical
- Depth at the basin entrance, 3.5 meters MLW typical
- Channel depth, 3.5 meters MLW minimum

Channels and Entrances

In the past, many marinas have been constructed so that some sort of protective structure surrounds the marina. In effect, the marina lies in a basin with one or more entrances. Although this type of construction is expensive, it may well be the only feasible means for providing the needed environmental protection for the moored boats.

The entrance to a marina requires a certain minimum width for safe maneuvering. The useable width of the entrance should be at least 19 meters, or four times the beam of the widest boat berthed in the marina. This allowance will permit boats to pass carefully when traveling at low speed, and would permit the entrance of a fire boat and tugs during an emergency.

The channel leading to a marina should have a clear width of twice the entrance width if at all possible. In any case, the channel should not be less than 19 meters wide - 30 meters is much better and should be a design standard.

In addition to being as wide as possible, the channel and entrance to a marina should be so located and oriented as to permit the speedy and safe passage of boats in time of storms, fire or other emergency.

Whenever arrangements can be made without adversely influencing the other parts of the marina, the entrance should be curved or jogged, or an island or a breakwater constructed to protect the entrance from offshore waves. These can offer a satisfactory degree of protection to the harbor entrance, permitting a width which could not be considered if unprotected. Where the entrance channel cannot be sheltered, it must be narrowed.

Turning Areas

Skilled boat captains can, it is true, turn their boats in little more than a boat's length. Unfortunately, very few operators of pleasure boats have such skills and turning areas are required.

The amount of space which must be allocated for turning areas is also affected by the type of boat which will prevail. All boats are affected by wind and some of the lightweight planing powerboats become unmanageable at slow speeds in high winds. Single screw boats and shoal draft I/O's will require the most space, twin screw boats and fin keel sailboats will require the least.

The need for turning areas will occur at any place in the marina where there is significant transient traffic, particularly at fueling piers. For average conditions, it is considered that a turning basin equal to 2¼ times the length of the longest boat would be reasonable. If there are frequent on-shore winds, or if there will be a large number of single screw power boats, this allowance might be increased to 2.5 or 2.75 times the longest anticipated boat.

It is normally not necessary to consider turning space between parallel rows of slips, but when the row begins to exceed a length of 100 meters or so, the question is no longer so academic. Inevitably, some unwary skipper will find himself running down the fairway with too much speed to safely make the turn in the available space. Where fairway widths are at or below the minimums recommended above, it is suggested that the innermost three or four slips on either side of the fairway be substantially shorter than the average, thus providing some turning room.

Location and Sizing of Fueling Facilities

Proper location of fueling facilities presents a dilemma. On the one hand, the fueling station should be as near to the waterside boundary of the marina as possible to avoid problems with boat traffic, to reduce boat wakes to a minimum, and to reduce the hazard from fueling fires.

On the other hand, location of the fueling station remotely from the marina office makes for a long walk to the pumps, increases the necessary run of fuel and electric lines 'with attendant installation and maintenance expense' and usually eliminates any hope of running the fueling station at a profit.

Where waterfront space permits, the ideal fueling station would consist of a short pier at right angle to the shoreline, on the order of 22.5 meters long and 6 meters wide, and placed immediately adjacent to the marina office. At least two sets of fueling pumps should be centered along this pier. In normal operation, boats would lie along either side of the pier, bow on to the shore 'but remember the need for turning space for the boats as they back away from the pier.'

If the fueling station must be located at the end of a long pier, the pier should be sized to permit operation of a golf cart along its length and should terminate in a substantial tee pier whose length on either side of the main walkway is greater than the adjacent slip lengths. A small protective shelter, if not a pierhead store, should be placed on the tee pier.

A workable solution for a large or very active marina might be to have a small close-in fueling station able to handle a couple of boats at a time for periods of low activity, and a continuously manned pierhead station for weekends and holidays.

In any event, a fueling facility should be able to accommodate several boats at once and should have some space for temporary tie-ups. A minimum of 60 lineal meters of unobstructed pier is recommended.

SHORESIDE FACILITIES

Planners have general guides for layout of roadways, parking lots and such, but some general observations relevant to marina design may be useful.

All parts of the land area of a marina should be accessible to large trucks. In particular, the large tanker trucks should be able to approach the fuel storage tanks without having to back and fill, and semitrailer delivery vans should be able to get to all possible unloading points. Special attention should be paid to the problem of placing the oversize vehicles carrying large boats in such a location that the boats can be off-loaded with minimum difficulty.

As a general rule of thumb, the distance from parked car to boat should not exceed 180 meters. Where this maximum must be exceeded, it will be necessary to provide a drop-off space near the head of each main walkway to permit the boat owner to unload passengers and gear before driving to the parking area. These drop-off spaces must be laid out so that one car in the space does not get in the way of others.

Where a full-service marina utilizes a mobile straddle crane or a forklift for boat transport, it is wise to give these vehicles access to all boat and automobile parking lots while loaded with the largest possible boat. This means that the access roads should not only have a minimum width of 7.5 to 9.1 meters, but also that the curvatures be appropriate. It is also necessary to assure that vertical clearances 'trees, power lines, etc.' permit the transport of sailboats with their masts up.

Accommodation of boats on trailers presents special problems. An automobile-boat combination usually exceeds 12 meters and can be as long as 18 meters, and backing these often exceeds the skill level of the average boat owner. Except where the combination is being backed down a launching ramp, no towed vehicle should ever have to be backed, but this requires large radius curves, straight-in/straight-out parking and so on.

AMENITIES AND AESTHETICS

A well designed marina will allocate as much space as possible to nicely grassed lawns and large trees. A small clean picnic area will always be popular and well used, and it is always a good idea to include a separate fenced area with a few basic playground facilities to accommodate children. Swimming pools are nice but not a necessity. On the other hand, a beach area, no matter how small, will be popular.

While it is obvious that a marina must have public rest rooms, it has apparently not been obvious to a majority of marina designers that rest rooms should be clean, warm, dry, brightly lighted and well ventilated. Considerable labor is required to maintain the rest rooms, and for this reason, control is necessary. Use of some sort of key system is recommended.

Finally, some accommodation must be made for handling effluent from boat holding tanks and from portable toilets. Holding tanks require a dockside pump alongside the fueling facility, preferably one with a minimum capacity since holding tanks on boats are not very prevalent and there is not likely to be a large future demand for pump-out facilities. The real problem comes from the "porta potti" or portable self-contained head, since these are not subject to regulation - there are no candidates for the job of head inspector.

Where the marina has the services of a municipal sewage treatment plant, it is only necessary to connect the holding tank pump and a separate dumping facility for the portable heads to the sewer line. Where a marina has its own septic tank or treatment facility however, misuse of anti-stink chemicals by most boat operators raises the possibility that introduction of the effluent is liable to kill the bacterial action of the system. Accordingly, it is recommended that the introduction of holding tank or portable toilet effluent into the local marina sewage treatment facility be prohibited. This in turn will require special care in facility design to permit proper supervision of the boat people. For example, it should not be possible to enter the marina toilet facilities without passing the marina office or some place where marina personnel can see and turn back - anybody carrying a portable toilet.

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APPENDIX C

MARINA DEVELOPMENT

SAMPLE PRO FORMA

There are various formats one can use to project income, expenses and capital expenditures. Whichever one is used, it is important to include enough detail in the presentation for it to be meaningful. Beyond that a format should be developed which is understandable to the principal parties involved. A set of notes should accompany the financial presentation so that the reader can understand the assumptions used to determine the projections. Assumptions used to determine income and expense items are based on actual experience in the immediate area (i.e., houseboats cost $50,000, slips rent on the average of $2 per foot, etc.) or on regional or national trends. These trends are often expressed in terms of a percentage of total sales. The sources of these percentages should always be stated.

The attached pro forma is an example of a format which extends projections over three years, as services are brought on line. Another format may show the first one or two years broken out by quarters to show seasonal differences and to provide more detail during those critical cash-flow years.

In the course of planning a development, it would not be unusual to prepare several pro formas based on various development and operational scenarios and assumptions. As such (with the assistance of computer programs), pro formas serve as very useful decision-making tools.

Sample Pro Forma for a Marina Operation

		Year 1	Year 2	Year 3
Income	Boat slip rentals			
	Marina store			
	Fuel and oil			
	Boat repairs			
	Boat sales			
	Boat dry storage			
	Houseboat rentals			
	Boat rentals			
	Boat transportation			
	TOTAL INCOME			
Direct Expenses	Cost of goods sold			
	Salaries			
	Employee benefits & taxes			
	Repairs & maintenance			
	Utilities			
	Supplies			
Indirect Expenses	Franchise Fee			
	Insurance			
	Marketing			
	Administrative & General			
	TOTAL EXPENSES			
INCOME BEFORE INTEREST & DEPRECIATION				
Less:	Interest			
	Depreciation			
INCOME (LOSS) BEFORE INCOME TAXES				

NOTES TO THE PRO FORMA

Income

1. Boat slip rentals: ____ slips; $____ per slip average annual income
   Occupancy rates: Year 1 -- ___%, Year 2 -- ___%, Year 3 -- ___%

2. Marina store: ________ customers; $___ average expenditure; ___% increase in years 2 and 3

3. Fuel and oil: $___/gallon; consumption: Year 1 -- __________ gallons
   Year 2 -- __________, Year 3 -- __________

4. Boat repairs: Year 1 -- $________/week, Year 2 -- ________, Year 3 -- ________

5. Boat sales: Year 1 -- $________/week, Year 2 -- ________, Year 3 -- ________

6. Boat dry storage: ______ boats, @ $_____ per month per boat

7. Houseboat rentals: Year 1 -- ___ boats x $________ income/boat
   Year 2 -- ___ boats x $________ income/boat
   Year 3 -- ___ boats x $________ income/boat

8. Boat rentals: Year 1 -- ___ boats x $________ income/boat
   Year 2 -- ___ boats x $________ income/boat
   Year 3 -- ___ boats x $________ income/boat

9. Boat transportation: ___ ___-passenger boats, ___% average occupancy
   Year 1 -- ____-day season, Year 2 -- ____, Year 3 -- ____

Expenses

10. Cost of goods sold: Store ____% of store sales
    Fuel ____% of fuel sales
    Boat sales ____% of boat sales

11. Salaries: ___% of total income (Source: __________; show source for each item)

12. Employee benefits and taxes: ____% of salaries

13. Repairs and maintenance: Year 1 -- ___% of total income, Year 2 -- ___%, Year 3 -- ___%

14. Utilities: Year 1 -- ___% of total income, Year 2 -- ___%, Year 3 -- ___%

15. Supplies: ____% of total income

16. Franchise fee: ____% of total income

17. Insurance: ____% of total income

18. Marketing: ____% of total income

19. Administrative and General: ____% of total income

20. Interest: Loan calculated at ___%, 25 years for marina
    10 years for houseboats and tour boats
    3 years for rental boats

    Cost of marina $__________ x __*__% = amount of loan $__________ *% to be financed by loan; perhaps 75%

    Year purchased, number and cost of boats
    Year 1 -- ____ x $________ houseboats = $__________
    ____ x ________ houseboats (different size) = __________
    ____ x ________ rental boats = __________
    ____ x ________ tour boats = __________
    Total cost $__________
    Year 2 -- ____ x ________ houseboats = $__________
    ____ x ________ rental boats = __________
    Total cost $__________
    Year 3 -- ____ x ________ rental boats
    Total cost $__________

    Interest and principal on boats and marina:

	Year 1		Year 2		Year 3	
	Interest	Principal	Interest	Principal	Interest	Principal
Marina	$	$	$	$	$	$
Boats						
Total	$	$	$	$	$	$

21. Depreciation: calculated by straight-line method:
    marina - 35 years; houseboats and tour boats - 10 years;
    rental boats - 3 years

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MARINA RATES

The following information has been abstracted from a marina rate comparability study conducted for Amistad Recreation Area in 1985.

Slip Rates

A review of marina rate-setting procedures at marinas in National Park System areas revealed the following various methods of establishing prices for a wet slip:

1. _\$_ x running foot length of slip.
2. _\$_ x square foot space of slip.
3. _\$_ x greatest length of boat or slip.
4. Flat rate per slip.
5. _\$_ x length of boat.
6. Covered slip versus open.
7. Water (potable or not) and/or electrical hookups on slip (metered or not).
8. Priced daily, monthly, annually or seasonally.

Slip rental rates may also vary depending upon the following factors:

1. Age or condition (maintenance) of marina.
2. Services provided (other than slips).
3. Geographic or regional area.
4. Fresh water vs. saltwater marinas.
5. Clientele (type of boats, i.e., yachts, houseboats, sailboats, motorboats, etc.).

Marina Comparables

There is no set criteria for identifying a marina. Webster's describes a marina as "a dock or basin providing secure moorings for motorboats and yachts and often offering supply, repair, and other facilities." The present classification widely used for marinas includes facilities with as few as 10 slips and no other services to an 800-slip property with full service restaurant, ship's store, fuel dock, sewage pump-out service, dry dock storage, boat sales and rentals, repair and maintenance services, etc.

Marinas may provide either covered or open slips, or a combination of both. Covered slips are more generally located in geographic areas where heavy rainfall and/or exposure to the sun (elements) produces heavy deterioration of boat finishes.

Marinas operate year-round (Glen Canyon) or seasonally (Yellowstone). Some are subject to extensive or sudden draw-downs (Amistad, Coulee Dam).

Marinas are often established to serve and promote one particular type of boater, e.g., sailboats or yachts, and offer slips and services which will best accommodate that type of boat. In these cases, all the boats moored at the marina are of the same type, and the prices are often geared to the economic level of the clientele. Many of these marinas are further identified by names such as "Yacht Club" or "Sailboat Harbor."

All of these factors must be taken into consideration when seeking comparable marinas and preparing rate determinations.

Operational Observations

The following general observations on marina operations may affect rates. They have been gathered from recent visits by concession analysts to various marinas.

The majority of marinas visited observed restricted access to boat slip docks. Entrance to the boat slip areas was generally barred by signing which stated "Boat Owners and Guests Only." Additionally, many marinas used a keyed or combination lock on a gate across the entrance to the boat dock.

Many of the comparables surveyed have discontinued their boat rental services during the past two years. It is the general opinion of some marina operators that boat rentals are no longer profitable unless there is an experienced engine repairman and repair shop located on site.

Marina operators revealed that their property (docks) and legal liability insurance rates have doubled or, in most cases, tripled during the past two years. Many of the operators indicated that they would be forced to increase their marina fees in order to compensate for the additional insurance costs.

In order to provide adequate insurance protection for the gulf coast marinas, the Marina Association of Texas provides "hurricane" group insurance policies for their members. Although this type of protection is not applicable to inland marinas, there are other specified insurance packages available.

At several marinas, it is common practice to lease out some of the specialized marina services. Areas such as engine and boat repair, food service, underwater recovery work, boat washing, waxing and hull scraping are routinely leased either to an on-site or off-site subcontractor.

The larger marina operators indicated that the profitable part of their business lies in the services they offer to boat owners rather than slip rentals or gasoline sales. It is also noted that other marinas find houseboat rentals and slip rental fees as the prime source of income.

Some marinas have constructed a breakwater for protection against wave (surge) action. The cause of marina break up is usually a strong concentration of both wind and underwater surge. The construction of a breakwater is a large non-revenue producing expenditure for marina owners; however, owners deemed it an absolute necessity for continued operation at their locations. In all cases, the breakwater was constructed at the expense of the owner without financial assistance from public or private agencies.

In recent years there has been an increase in the length of boats and a significant increase in beam. This means that fewer boats can be moored in the available space, and the financial return from slip rentals based on a slip length criterion is likewise reduced. To compensate for this, one new marina facility is pricing slip rentals on a square foot basis.

In order to promote additional marina business, many of the marinas had sailboat clubs associated with them who arranged races throughout the year, while other marinas encouraged or sponsored boating activities/events for youth clubs in the local communities.

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V. SEASONAL EMPLOYEE HOUSING

Traditionally, seasonal housing for concession employees has been provided in standard dormitories with a common bath facility, or in cabins. In recent years some new types of concessioner seasonal housing have responded to the housing preferences of today's seasonal employees, which has represented a move away from the traditional dormitory facility.

This chapter of the handbook will discuss the reasons for this shift in style of housing, and provide some recommendations and sample floor plans for future seasonal employee housing. Guidelines for the construction of permanent employee housing can be found in NPS-76, Housing Design and Rehabilitation Guideline.

SEASONAL EMPLOYEE PREFERENCES

The recommendations found later in this chapter are based on informal observations at parks, discussions with concessioner seasonal and park employees, a questionnaire completed in 1987 by NPS seasonal employees, and observations of housing provided in recent years by colleges and universities, the source for recruitment of many concessioner seasonal employees.

Privacy

All of the above sources indicate a growing dissatisfaction by employees with the degree of privacy that can be provided in a traditional dormitory. The preference is for smaller living groups. This preference for improved housing is shared by some concessioners who feel their employees not only deserve improved living quarters, but that the quality of housing can be a determining factor in an employee's decision to remain throughout the season or return the following year.

The NPS seasonal employee questionnaire reinforced this preference with the following responses:

IMPORTANCE OF PRIVACY	Necessary	Desirable	Not Desirable
Sleeping area	84%	16%	0%
Toilet/sink area	61	34	5
Shower/bath area	57	33	10
Kitchen area	30	51	20
Living area	22	51	26

Storage

Another concern raised by employees is the need for adequate closet and storage space. These concerns generally arise out of inadequate existing space. Along with closet and storage space is the need for secure storage of valuables and other items subject to theft.

The NPS questionnaire indicated that additional clothing storage was found to be necessary (42%) or desirable (44%) by the employees and that additional general storage space to be necessary or desirable by 46% and 44% of the employees. Additional outdoor storage for bicycles, professional equipment and personal tools was also found to be desirable or necessary by about one-half of the employees.

Style of Housing

The NPS questionnaire asked seasonal employees to indicate their preference for living style units. The response was as follows:

PREFERENCE FOR LIVING STYLE UNIT	Necessary	Desirable	Not Desirable
Efficiency apartment	39%	46%	12%
2-3 bedroom apartment	36	48	14
Cabins	32	51	16
Dorm (1 person per room)	33	32	34
Shared house	18	42	38
Bunkhouse (more than 1 person per room)	8	14	76

The overwhelming response against shared sleeping quarters is evident. This obviously corresponds with the strong preference for privacy in sleeping and bathroom areas.

RECENT CONCESSIONER HOUSING CONSTRUCTION

Several concessioners have recently constructed seasonal housing which has addressed the above concerns. The three basic styles have been two-bedroom units with a shared bath, efficiency units (with or without kitchens), and cabins.

The two-bedroom units typically provide outside entrances to each bedroom area and shared bath between the two bedrooms. Each bedroom accommodates two employees and includes a closet, dressers, two single beds, a desk or two, and chairs. Colleges often use this type of layout, with one entrance off a central hallway to a foyer or living room which leads to the bath facility(ies) and bedroom(s). There is usually a common area in the building or next door which provides recreation equipment, TV, a kitchen and laundry facilities. Bedrooms constructed by concessioners ranged from 190 to 260 sq. ft. with bath areas of 62 to 80 sq. ft.

The efficiency units resemble motel units, with two persons sharing the unit. Entrances were either outside or to a hallway. Some units may include a kitchenette. Efficiency units ranged from 340 to 380 sq. ft. in size, with bathrooms of about 64 sq. ft.

Cabins usually resemble efficiency units, however, if larger they may be designed to house three or four employees, with a bath either in the cabin or nearby. It has been noted that if employees have a choice between a new traditional dorm and older guest cabin units no longer in service, many, if not most, will choose the cabin.

It is recognized that these types of housing generally are more expensive to construct per employee than a traditional dorm. (These high costs can be reduced through the use of modular construction and standard off-the-shelf designs.) Although housing costs were more expensive, the concessioners who constructed them felt these increased costs were more than offset by increased employee morale, work productivity and the return of quality employees. They also felt the improved housing met their responsibility to provide satisfactory living conditions for their employees. It has also been noted that smaller living units have resulted in improved care and treatment of these units due to an increased sense of ownership by employees in their living area.

RECOMMENDATIONS

The following guidelines are provided as recommendations for concessioners and park managers to consider when planning and designing seasonal housing. The construction of dormitories with one or two shared baths is not recommended. This type of housing is not acceptable to most employees today.

Privacy

All future seasonal housing should provide for smaller living units than have generally been provided before as dormitory units, offering increased privacy in sleeping and bathroom areas. Private entrances should be provided in most cases. Bedroom occupancy should be limited to no more than two persons.

Soundproofing between bedroom units, and between units and bath or public areas, should be at a Sound Transmission Class rating of STC 50.

Features

Housing units should provide sufficient closet and storage space. Closets should be at least 3' x 6' in size and have doors. A dresser should be provided for each person, as well as lockable storage. The dresser could be supplemented with bed units which include built-in drawers. A desk and chair should be placed in each bedroom, along with two comfortable chairs and adequate reading lights. Twin-long beds should be considered for male housing units.

The toilet and shower or tub/shower should be placed in separate rooms from washbasins to provide increased flexibility in use of the bath area, effective ventilation and more privacy. Sliding doors for tubs are recommended. At least one washbasin per two people should be provided, either in the bathroom area or in the bedrooms. Separate enclosed storage areas for personal items should be provided for each employee near the washbasins, along with enclosed storage for shared supplies. Adequate ventilation/fan systems should be provided for shower and toilet areas.

Configurations

A two-bedroom unit with shared bath or an efficiency unit is recommended. Several of these units can be constructed side-by-side in one building with a commons area in the middle, or as duplex units. When a dining service is to be provided within the same building, or where inclement weather is common, efficiency units off a central hall might be a trade off to offering outside entrances to two-bedroom units. Examples of two-bedroom configurations are provided on the next page.

If the construction of cabins, or rehabilitation of existing cabins is being considered, they should provide units similar to the above.

If several housing units are to be constructed at one time, consideration should be given to separating employees by shifts, providing separate units for couples with private bath, and providing separate buildings for supervisors/managers, perhaps with kitchen units.

Floor Space

The following floor space minimums are recommended. Floor space provided in recent concession housing is also provided as a point of comparison. All are for units housing a maximum of two persons per bedroom.

Floor Space	Recommended Minimum	Range in Existing
Efficiency (2 persons)	340 s.f.	322-380 s.f.*
-bedroom/closet	280 s.f.	240-289 s.f.
-bath	60 s.f.	45-64 s.f.
Two-bedroom unit (4 persons)	500 s.f.	477-531 s.f.*
-bedroom/closet (2)	420 s.f.	372-456 s.f.
-bath	80 s.f.	75-84 s.f.

*Totals may include entrance hall/foyer space (28-42 s.f.)

Employee Facilities

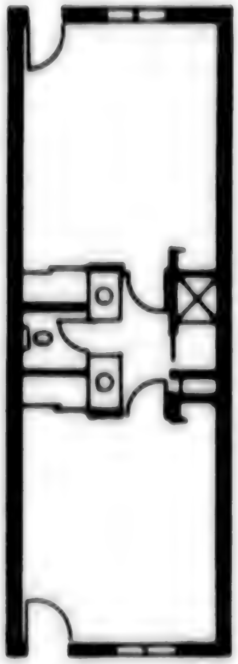
Commons Areas

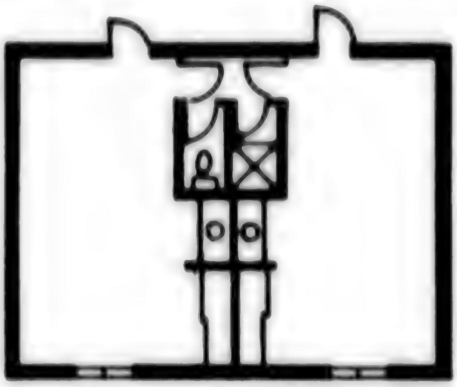
Each housing area should have a commons area within the building if it is a large facility, or at a nearby separate facility if duplexes are used. This facility could offer a recreation area, TV lounge, a washer/dryer area, pay telephones, kitchen, etc. A common area in a large building could primarily be a gathering and TV area, with the other services offered in a separate building. This common area allows one roommate to watch TV, talk with others, etc., while the other roommate is sleeping, or to otherwise have access to a "living room" area.

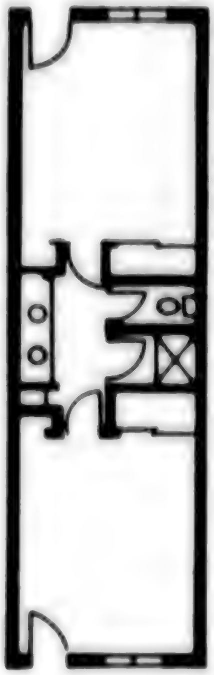
Employee Recreation Facilities

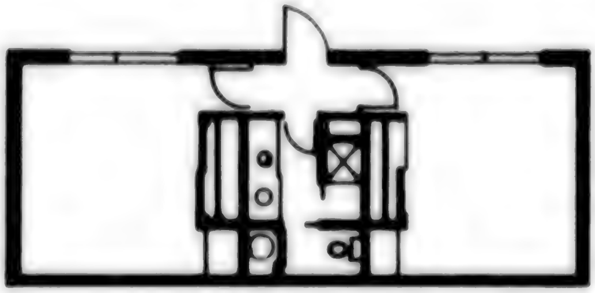
Concession developed areas should also include recreation facilities for employees. Such facilities could include basketball, volleyball, and tennis courts, a baseball field, health and fitness facility, movies, game tables for chess, cards, etc., shuffleboard, VCR, dance floor, etc.

SAMPLE TWO-ROOM EMPLOYEE UNITS









The above drawings are examples of two-bedroom employee housing units. Each can be used in multiple-unit buildings, fourplexes, or cabins. The unit in the upper right corner can be used in a building with center corridors. The different bathroom layouts feature flexibility of use, privacy, and adequate space.

VI. DESIGN AND CONSTRUCTION PROCEDURES, CONCESSIONER-CONSTRUCTED FACILITIES

The National Park Service has the responsibility to provide, either through a contracted concessioner or directly, approved facilities necessary for the enjoyment, resource protection and management of the parks. The location of a facility, and its design, construction, and construction materials must be consistent with the perpetuation and protection of the resources and aesthetic values of the park.

The purpose of this chapter is to suggest some procedures which will guide all parties, including architects and engineers (A/E's), contractors, concessioners and Service personnel through a development project, in order that the above objectives may be met. It is an attempt to assure that information is provided early in the planning and design phase on requirements, procedures, products, timetables, involved persons, responsibilities, approval authorities and available reference materials. Hopefully, this will facilitate a smooth, efficient planning, design and construction process. Therefore, it is recommended that a copy of these or similar procedures be provided to involved A/E's, contractors, concessioners, etc.

It should be noted that for very small projects, as determined by the regional director, the Service may elect to simplify the procedures listed in the following checklists. Also, regional offices should feel free to otherwise modify these procedures as may seem appropriate.

NATIONAL PARK SERVICE MANAGEMENT POLICIES

Management policies concerning park facilities have been developed by the National Park Service. A/E's, contractors and concessioners shall be familiar with the following specific NPS policies on design quality and control, and construction:

Facility Planning and Design

The following planning and design policies are particularly applicable to concession projects:

> Designs for park facilities, regardless of their origin (NPS, contractor, concessioner, or other), will be harmonious with and integrated into the park environment and will be subject to the same high standards of design and functionality and to the same review and approval processes, including inspection while construction is underway.
>
> **Life-Cycle Costs.** All costs, including initial construction costs, ongoing maintenance costs, and operating costs, will be considered in the planning, design, and construction of facilities.

Location. Major facilities within park boundaries will be placed only in development zones established by the park's approved general management plan.... When structures that are not historically significant are determined to be inappropriately placed in prime resource areas, they will be removed.

Integration of Facilities into the Park Environment. Facilities will be integrated into the park landscape and environs so as to cause minimum impact. Development will not compete with or dominate park features.

A cohesive design theme will reflect the purpose and character of the park, or of an individual developed area of a large park. Standard designs and components may be used, but they will be adapted as appropriate to the specific site and conditions as part of the design process.

Full integration of facilities into the park environment will involve

> innovative concepts for grouping facilities and activities, both in design of new development and in redesign of existing complexes, building on the architectural and landscape elements already present
>
> thorough resource and user analyses
>
> sensitivity to cultural, regional, aesthetic, and environmental factors in the selection of site, materials, and forms
>
> knowledge of values and other sociocultural concerns of park associated ethnic groups

Siting Facilities to Avoid Natural Hazards. Facilities will not be located in areas where natural processes pose a persistent threat unless no practicable alternative site exists and unless all safety and hazard probability factors have been considered. Hazardous areas include sites where unstable soils and geologic conditions, fault zones, thermal areas, floodplains, flash-flood zones, and coastal high-hazard areas. Where facilities must be located in such areas, their design and siting will consider the nature of the hazard and include appropriate mitigating measures to minimize risks to human life and property. Requirements for development in floodplains and wetlands are contained in Executive Order 11988, "Floodplain Management" (42 USC 4321), and Executive Order 11990, "Protection of Wetlands" (42 USC 4321), and their implementing guidelines.

Chapter 9,
Park Facilities

Construction

The following construction policies are particularly applicable to concession projects:

> **Construction Sites.** Construction sites will be limited to the smallest feasible area. Ground disturbance will be carefully controlled to preclude undue damage to vegetation, soils, and archeological resources, and to reduce air, water, and noise pollution. Care will be exercised to ensure that construction equipment and all construction materials imported into the park are free of undesirable species.
>
> **Revegetation and Landscaping.** The selection of plant material and cultivation practices will be guided by the policy for "Landscapes and Plants" in chapter 4. Irrigation to maintain exotic plantings will be avoided except where such irrigation is part of an approved management program essential to achieve park objectives and when dependable supplies of water are available.
>
> Whenever practical, soils and plants affected by construction will be salvaged for use in site restoration. Any surplus soils and plants may be used for the restoration of other degraded areas within the park, and surplus soils should be stockpiled for future use. If additional soil and plants are needed to restore disturbed sites, they may be obtained from other sites in the park if it is determined that use of an in-park source will not significantly affect cultural or natural resources or ecological processes. In any case, imported soils must be compatible with existing ones and fulfill horticultural requirements of plants used for restoration.

Chapter 9,
Park Facilities

Concessions Facilities

Public accommodations, facilities and services in the parks are provided through concession contracts, permits and commercial use licenses with private companies. The Concessions Policy Act (Public Law 89-249) states that it is "the policy of the Congress that such development shall be limited to those that are necessary and appropriate for public use and enjoyment of the national park area in which they are located and that are consistent to the highest practicable degree with the preservation and conservation of the areas."

The following policies are concerned with concession development:

Planning Criteria for Park Concessions. Any building program or service authorized in a concession contract or permit will be in conformance with the appropriate approved plan(s) for the area in consideration. A decision to authorize a park concession will be based on a determination that the following conditions will be met:

The facility or service is necessary and appropriate for public use and enjoyment of the park in which it is located.

The use of the facility or service will enhance the use and enjoyment of the park without resulting in impairment of park resources and values.

The facility or service will be located where the least impact on park resources and values will occur.

The number of sites and the locations and sizes of the tracts of land assigned for necessary facilities will be the minimum essential for proper and satisfactory operation of the facilities, consistent with proper spacing and preservation of aesthetic values. Moreover, such developments as are permitted will be constructed so as to be as harmonious as possible with their surroundings.

Design and Construction. Plans and specifications for buildings and other structures to be built or rehabilitated by a concessioner, including plans for landscaping, will be prepared at the expense of the concessioner. Plans and specifications will be submitted to the superintendent for approval by an appropriate NPS authority at both the comprehensive design and project planning stages, before construction is begun. Approved plans will be adhered to by the concessioners during construction. Plans for concession facilities are subject to all the planning, environmental compliance, design, and historic preservation standards applicable to development in the national park system.

Chapter 10
Concessions Management

Accessibility for Disabled Persons. Concessioners share the National Park Service's responsibility to provide the greatest degree of access practicable for both employees and visitors to facilities and services within the terms of existing contracts and agreements. Where there is no specific language regarding accessibility in an existing concession contract, the National Park Service will address the issue of compliance in the annual concession operating plan. When new contracts are negotiated or new construction occurs, access requirements and a schedule for achieving them will be included.

PLANNING, DESIGN AND CONSTRUCTION OVERVIEW

Process and Procedures

Planning. Parties outside the Service, such as A/E firms, contractors and concessioners are often responsible for developing drawings and specifications for Service-approved construction projects, including the renovation of buildings as well as construction of new buildings. These designs are submitted to the Service for review, comment and eventual approval.

Prior to the beginning of any design work, the project must be reviewed and approved by the regional director. This review will consider whether the project is consistent with legislative, historic, cultural, park planning and National Environmental Policy Act requirements. If it is a proposed concession facility, this review will also consider whether the facility is authorized by a concession contract, that it has been determined that the facility is "necessary and appropriate," that there is adequate NPS funding, if required, and that the project is economically feasible.

For concession projects, the planning section of NPS-48, Concessions Guidelines, provides assistance in the areas of concessions planning processes and procedures, including a checklist when considering whether a proposed facility is "necessary and appropriate."

Design and Construction. The development of drawings and specifications should begin with a pre-design conference to discuss site location, architectural considerations, procedures to follow, etc. A suggested list of participants for this conference and later steps can be found on the following chart. This is followed by the preparation of schematic and/or preliminary plans in the case of larger projects, for review and approval of the regional director. Construction drawings and specifications are then prepared, and submitted simultaneously to the park superintendent, regional office, and as needed to State offices and other National Park Service offices. Each receiving office should receive three copies of the plans and specifications.

A pre-construction conference should be held prior to actual construction. Builder's Risk Form insurance coverage, a performance bond and a labor/materials payment bond may be required before construction commences. The National Park Service and the concessioner, in the case of concessions construction, will conduct inspections during construction, with the park superintendent maintaining a file of all inspections and their results. Pre-final and final inspections shall be conducted, with participation by NPS representatives. If the construction is a concession contract requirement, the park superintendent will advise the regional director upon completion of the project if the contractual commitment has been met. The concessioner is advised by the regional director when the project completion is approved.

Process Summary Chart. The following chart suggests procedures to follow and participants to be involved for various levels of construction. (Regional offices may wish to adjust these procedures.) The chart is separated into three categories to represent levels of complexity of development. Dollar amounts and participant involvement may be adjusted by the regional director depending on the nature of the project. For example, any work involving extensive life safety or electrical modifications, even if under $10,000, may warrant Category II level of involvement.

The following sections of this chapter of the handbook provide a more detailed list of procedures and products which are to be considered during preliminary design, final design and construction phases. It should be noted that these checklists follow normal industry practices, and are commonly used by other jurisdictions.

Codes and Standards of Construction

Facility designs must comply with National Fire Protection Association Codes and Standards, the Uniform Building Code, National Electric Code, Uniform Plumbing Code, and Uniform Mechanical Code. In the event of conflict between codes, the more stringent code, as determined by the regional director, will apply. Also, these designs must be predicated on the latest technology of construction, materials, energy conservation and efficiency of operations, as well as compatibility with the environment.

Design recommendations for lodging units, food and beverage facilities, marinas, and seasonal housing, as developed by the NPS Denver Service Center (DSC) Concessions Branch, and standards for audiovisual and exhibit design as developed by the NPS Harpers Ferry Center (HFC), are available from the regional office. These recommendations will be helpful to the park staff, concessioner and A/E during the initial planning and design stages of related facilities.

A/E's, Contractors, Drafting

Facility designs, except in the cases of very simple construction (as determined by the regional director), must be prepared by an architect or engineer with professional registration in the state where the construction is to occur.

The regional director also reserves the right to require that contractors be licensed by the state depending upon the nature of the construction project.

All drawings produced by the concessioner and/or A/E shall comply with NPS-10, Drafting Guidelines for Design and Construction Drawings. Copies are available from the regional office or the DSC Concessions Branch. Also, all concessioner drawings, after they are received by the park, are given numbers in the 70,000 base number series before being submitted for review (NPS-29, Drawing and Map Numbers Guideline).

Accessibility for Handicapped Persons

Concessioners share the Service's responsibility to provide the greatest degree of access practicable for both employees and visitors to facilities and services, and accessibility must be considered in the design and construction of facilities. Extensive guidelines, including diagrams, measurements and other technical provisions are found in the Uniform Federal Accessibility Standards, which can be obtained from the regional concessions office or the DSC Concessions Branch.

SUGGESTED
CONCESSIONER DESIGN AND CONSTRUCTION PROCESS

Item	Date	Participants I	Participants II	Participants III
Pre-design conference and on-site review of proposed project	______	Pk, Conc, (A/E)	Pk, Reg, Conc, A/E	Pk, Reg, Conc, A/E
Develop alternative schematic designs	______			A/E
Review designs and select preferred alternative	______			Pk, Reg, DSC
Develop preliminary plans	______		Conc, A/E	Conc, A/E
Review of preliminary plans	______		Pk, Reg, (DSC)	Pk, Reg, DSC
Develop construction documents	______	Conc, (A/E)	Conc, A/E	Conc, A/E
(On-site) review with 90% complete construction documents	______	Pk, Conc, (A/E)	Pk, Reg, Conc, (A/E	Pk, Reg, Conc, (A/E)
Revision and completion of construction documents	______	Conc, (A/E)	Conc, A/E	Conc, A/E
Review and approval of construction documents	______	Pk, (Reg)	Pk, Reg, (DSC)	Pk, Reg, DSC
Revisions to construction documents	______	Conc, (A/E)	A/E	A/E
Pre-construction conference	______	Pk, Conc, (CC)	Pk, Conc, CC	Pk, (Reg), Conc, CC
Construction: Inspections	______	Pk, Conc	Pk, Conc, (Reg)	Pk, Conc, Reg
Pre-final Inspection	______		Pk, Conc, (Reg)	Pk, Conc, Reg
Final Inspection	______	Pk, Conc	Pk, Conc, (Reg)	Pk, Conc, Reg
Approval of completion	______	Pk	Pk, (Reg)	Pk, Reg

Date: To be determined by park and region

Categories:
I - Modifications up to $10,000
II - Modification between $10,000 and $50,000; new construction up to $100,000
III - Modification over $50,000; new construction over $100,000
These categories are subject to change by the Regional Director

Participants: Park (Pk), Regional Office (Reg), Denver Service Center (DSC), Concessioner (Conc), Concessioner's Architect or Engineer (A/E), Concessioner's Contractor (CC)

() = Optional

PRELIMINARY DESIGN

General

The purpose of preliminary design is to perform sufficient investigative and design effort to satisfy park and regional personnel that the design solutions are sound and are the best practicable solutions, and to document the decisions reached. Review of designs at this stage will avoid costly design changes during the final design phase. The preliminary design concepts are documented in drawings, and sometimes supported by written design analysis and calculations. The detail must be sufficient to provide an understanding of the project.

The preliminary design checklist, along with the checklists for final design and construction will be reviewed during a pre-design meeting so that all parties will have a thorough understanding of procedures, products, timetables, approvals required by the regional director, etc.

The concessioner or the selected design firm will be responsible for all aspects of the design, including scheduling, timely performance, exploring all design alternatives, compliance with the intent of approved general management and development concept plans, environmental documents, compliance with state and local codes for design, safety and health, and coordination of the project with others, including the park, regional office and other NPS offices. The following checklist will note the involvement of NPS and concessioner participants at various stages of preliminary design.

Submission of Drawings

Drawings must be submitted in triplicate simultaneously to the park superintendent and regional offices, and as necessary to appropriate state and local jurisdictions and other NPS offices. This concurrent review will facilitate the review process.

A reproducible mylar of the cover sheet with an approval block shall be submitted with the preliminary design to the park superintendent. The superintendent upon completion of the review will sign the cover sheet as "recommended," and forward it to the regional office for "approval" signature by the regional director.

CHECKLIST
PRELIMINARY DESIGN PHASE

TIME	DATES	ITEM	INVOLVED PARTIES
		A. Pre-design Meeting	
		General	
		1. Review of Preliminary, Final and Construction Checklists	
		2. Authorized/Responsible representatives	
		a) List from each party	
		b) Approval of drawings/change orders	
		c) Project manager/supervision	
		3. Construction Limits / Site Planning	
		4. Quality / Design Criteria	
		5. Codes	
		6. Special environmental and cultural conditions	
		7. As built drawings/specifications	
		8. Warranties	
		The Project	
		1. Concession construction program/schedule	
		2. NPS construction program/schedule	
		3. Funding	
		4. Involvement of other agencies, utilities, etc.	
		5. Distribution of drawings	
		B. Alternatives (optional)	
		1. Development of alternatives	
		a) Format and content	
		b) Submittal to NPS with recommended alternative	
		2. Selection of Preferred Alternative	
3 Wks		a) NPS review	
		b) Approval letter from Regional Director; or disapproval, with comments (repeat steps 1 and 2)	
		C. Actual Preliminary Design	
		1. Drawings	
		a) Cover sheet (furnished by NPS)	
		b) Site Plan (if required): known facilities, grading, existing and proposed utilities, landscaping	
		c) Floor plans, elevations, sections, rendering	
		2. Design Analysis	
		a) Identify problem	
		b) Proposed solution	
		3. Calculations (to support critical design elements)	
		a) Foundations	
		b) Structural (seismic, snowload, wind, etc.)	
		c) Equipment sizing	
		4. Model (if required by Regional Director)	
		5. Submittal to NPS (see previous page for instructions)	
		D. Reviews / Approval	
3 Wks		1. NPS review	
		2. Approval letter from Regional Director, or disapproval, with comments (repeat steps C and D)	

FINAL DESIGN

General

Detailed design is done at this phase, and the products are construction drawings, specifications, and calculations. Final design is based on and must be in accordance with an approved preliminary design.

In cases where the approved preliminary design documents are not current, they must be thoroughly reviewed to insure they meet current management requirements.

Submission of Drawings

Drawings must be submitted in triplicate simultaneously to the park superintendent and regional offices, and as necessary to appropriate state and local jurisdictions and other NPS offices. This concurrent review will facilitate the review process.

A reproducible mylar of the cover sheet with an approval block will be submitted with the final design to the park superintendent.

CHECKLIST
FINAL DESIGN PHASE

TIME	DATES	ITEM	INVOLVED PARTIES
____	________	A. Actual Design (to 90% completion)	________
		1. Drawings	
		a. Cover Sheet (furnished by NPS)	
		b. Site Plan: known facilities, grading and topography, utilities, roads, significant physical features, construction limits	
		c. Architectural Drawings: plans, elevations, sections, details and schedules	
		d. Engineering Drawings	
		1) Geotechnical	
		2) Structural: plans, sections, details	
		3) Electrical: plans, details, wiring diagrams	
		4) Mechanical: isometrics, plans	
		5) Sanitary: plans, profiles	
		6) Civil: plans, profiles, sections, details	
		e. Landscape Plan: plans, details	
		2. Specifications (quality of materials, methods of construction, standards of workmanship)	
		a. Sections (basic units of work) using the Construction Specifications Institute (CSI) 16 division format	
		b. Special Conditions (preservation of natural features, park rules and regulations	
		3. Calculations	
		a. Foundations	
		b. Structural (seismic, snowload, wind, etc.)	
		c. Equipment Sizing	
		B. 90% Review (on site, if necessary)	
3 Wks	________	1. NPS review of drawings, specifications and calculations when approximately 90% completed	________
	________	2. Approval letter from Regional Director; or disapproval, with comments (repeat steps A and B)	________
		C. Completion of Design	
____	________	1. Incorporation of review comments, and complete documents	________
	________	2. Submit to Regional Director and park superintendent for final review and approval (see previous page)	________
		D. 100% Completion, Review and Approval	
3 Wks	________	1. NPS Review	________
	________	2. Approval letter from Regional Director; or disapproval, with comments (repeat steps C and D)	________

CONSTRUCTION

General

After approval of the final construction drawings, and prior to the pre-construction conference, the A/E or concessioner will submit a construction schedule to the park superintendent. The park superintendent will also require Builder's Risk Form insurance coverage, and, as assurance of completion, may additionally require a contractor's performance bond (100%) and a labor/materials payment bond (50%).

Items to be submitted for review and approval prior to purchase or fabrication include major building materials such as brick, stone and tile samples, paint colors, furnishings, carpet, roofing and siding samples, and other major construction material containing color.

The contractor will send any necessary change orders to the superintendent for review and approval by the regional director. Change orders should be sent to the park superintendent as early as possible. Approval is required prior to the purchase or fabrication of any material to be used in the execution of such changes.

It is the responsibility of the A/E or concessioner to provide inspections to assure that all construction is in compliance with approved plans and specifications. On large, complex projects, it is recommended that a building inspector be retained by the A/E or concessioner during the entire project. Additionally, designated park staff or regional staff will conduct periodic inspections. The park superintendent and regional director reserve the right to review and reject any or all work in the interest of public health or safety, or due to defective materials and workmanship. The park superintendent shall maintain an accurate file of all inspection comments.

When outside agencies have jurisdiction to review a project, i.e., public health or life safety, the contractor shall comply with all regulations as issued by the agency.

Inspections

A pre-final inspection will be conducted with NPS representatives when the facility is about operational and nearly complete. A "punch-list" of items remaining to be satisfactorily accomplished will be developed and a determination of whether the building is "substantially complete" will be made. Also, a draft of an Operations and Maintenance (O&M) Manual and a plan for on-site O&M training of the operating staff is to be presented.

A final inspection, the training of operating staff and receipt of the final O&M Manual and reproducible mylars of as-built drawings by the A/E will precede acceptance of the facility by the regional director.

Post-construction activities will include performance of warranty work and a post-construction inspection and evaluation 10 or 11 months after the acceptance of the building.

CHECKLIST
CONSTRUCTION PHASE

TIME	DATES	ITEM	INVOLVED PARTIES
____	____	A. Pre-Construction Conference	____
		1. Authorized Representatives Designated	
		a. Contractor	
		b. NPS Contracting Officer	
		c. NPS Daily Liaison	
		d. Concessioner / A/E	
		e. Inspections: Concessioner / A/E NPS	
		2. Emergency Procedures / Contacts	
		3. Change Order Procedures	
		4. Payment Procedures	
		5. Subcontractors	
		6. Shop Drawings	
		7. Park Rules and Regulations	
		8. Geographic Construction Limits	
		9. Saturday, Sunday and holiday work	
		10. Documents required or recommended	
		a. Project Schedule	
		b. Builder's risk certificate	
		c. Performance bond	
		d. Labor/materials payment bond	
		e. Contractor's safety/emergency program	
		f. Notice to proceed	
		B. Actual Construction	
____	____	1. Construction Period	____
		2. Inspections	
____	____	a. Concessioner / A/E	____
____	____	b. NPS	____
		C. Pre-final Inspection	
____	____	1. Inspection and verification of systems operation	____
____	____	2. Letter of "substantial completion," with punch list	____
	____	3. Draft O&M manual; on-site training program	____
		D. Final Inspection	
____	____	1. Inspection (if not accepted, repeat steps B, C and D)	____
____	____	2. Receive as-built drawings and final O&M Manual and Training	____
	____	3. Acceptance letter from Regional Director	____
		E. Post Construction	
1 Yr	____	1. Performance of warranty work	____
	____	2. Post-construction inspection and evaluation of the project (conduct one or two months prior to the end of the contractor's warranty period)	____

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END

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